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Women of Our Industry

THE Electrical Association for Women has reason for self-congratulation on the position it has achieved in seven years. The Conference luncheon attracted, we believe, the largest number of people that has hitherto attended a similar electrical function, and the presence of past and present Ministers of Transport and leaders of all sections of our industry demonstrated the importance attached to the work of the Association by those most concerned with electrical development. There were also present men and women who have achieved eminence in non-electrical fields, and these might be said to represent the interests of the community at large.

We may assume that the support given to the E.A.W. by the first group is very largely influenced by a proper regard for material considerations, *i.e.*, the desire to sell more electricity and more apparatus for use in the home, where an offset has been found to the slump in the industrial load.

For this much credit must be given to Miss Haslett and her associates, who have influenced the situation by helping to make the public electrically minded. But much of their work will come to fruition only after the lapse of years; of such a kind is the steady progress made in training the young idea in electrically equipped schools and colleges to regard electricity as the natural means for performing duties of all kinds, and also the education of consumers in rural areas through the women's institutes.

Meanwhile, on the immediately practical plane, an important step has been taken in the award of diplomas that will be recognised by the appropriate bodies as conferring a professional status on the recipients. At the conference the first diplomas were awarded to those demonstrators who had proved their ability by experience.

As in the initial stages of organisation for all professions, there has been no insistence on academic qualifications, nor at any stage will they be enough by themselves. The work implies a close contact with the public, and individuality and tact are essential qualities. As an instance of the last quality, we may refer to Mr. Gillott's suggestion that demonstrators should not offer to teach people to cook electrically, but how best to use the switches. Also, every care should be taken to avoid creating the idea that there is anything at all difficult about the use of electricity.

Inquiries received by the Association from polytechnics and other educational bodies indicate that the institution of the diplomas meets a real need; it should also do much towards extending electrical equipment in such establishments.

We wish that the lay Press would cease to refer to the members of the E.A.W. as "electrical experts." This is to overlook the valuable work being done everywhere by the volunteers of the movement, whose only interest in electricity is that it is the most desirable of all helps in the home. These bring into the counsels of the Association the most practical point of view—that of the consumer without any axe to grind.

We have implied above that the development of electricity in the home depends upon the work of women. But that by itself will not avail to overcome many of the technical and commercial intricacies of electricity supply. The E.A.W. has always shown itself ready to profit by the advice and help of men with administrative experience, as, for instance, in the constitution of the diploma committee, so ably presided over by Mr. Downe.

Indeed, what we regard as of the greatest promise for the future in this field is the whole-hearted co-operation evident between men and women in furtherance of common aims.

The Dairy Load

THE milk dairy installation described this week is an illustration of how some consumers can be induced to improve their load factors. True the load represented can more easily be adjusted than most others in this respect, but in any case the supply undertaking must inspire the movement. Expenditure on extensive non-electrical plant with the main object of improving supply conditions for the electrical installation

clearly shows what concessions for high load factor, etc., mean to the consumer, although we would prefer to see tariff adjustments which would make the installation "all-electric." The combined milk and ice-cream business can obviously represent a very favourable electrical load, and there must be similar opportunities for arrangements of mutual benefit in many other towns and districts.

Gas By The Unit

Buying gas by the therm, which sounds only one-fifth as expensive as buying it by the 1,000 cu. ft., has never been popular. Will the new method devised of selling it by the "unit" receive greater favour? We doubt it. Some credit is given by the gas industry to the more efficient utilisation efficiency of electricity by making the gas unit contain 4,000 B.th.u., as compared with the 3,412 B.th.u. in one kWh. The margin of 15 per cent. is not nearly enough to allow for the difference in efficiency under working conditions, and the consumer, who is educating himself on points of ultimate cost, will find out that even 5,000 B.th.u. of gas would cost him more than the unit of electricity. He would probably tend to go to the next round number and conclude that 50 per cent. should be added to the gas unit to make a correct comparison. This might be unfair to gas!

Tariffs and Load Factor

Large industrial consumers do not take kindly to the suggestion that they must create night loads to get more favourable supply terms, although in most cases that is their only hope. But in this way they could obtain far more substantial relief than they have in mind when applying for a price reduction. Night and long-period loads are being obtained from space- and water-heating schemes in and out of the domestic field by energetic propaganda, and in the same way the industrial supply load factor can be improved. It is not sufficient, however, for the undertaking to wait until it is approached by the consumer for a tariff reduction. Poor load factor is still a stumbling block to the supply man, and its improvement should still be a primary consideration.

Condensers or Motors?

One sees many condensers installed by industrial consumers throughout the country for power-factor correction, but there are motors available nowadays which are guaranteed to produce practically the same results? Recently we saw a motor which was installed by a large power consumer because of the makers' claim that it would not worsen the p.f. of the installation. But the happy result was a considerable overall improvement, and 0.85 p.f. was indicated under a "swinging" load which would worry a good many works engineers.

Little Things

We referred in our issue of April 8th to the value of such apparatus as electric clocks and wireless in popularising the use of electricity in the home, even if their energy consumption be small. Mr. R. H. Scotson, borough electrical engineer of Middlesbrough, told us the other day that last year he connected up 3,000 new consumers; inquiries showed that no less than two-thirds of these desired the supply primarily for radio purposes.

Neutral Switching

The care that should be exercised to avoid the installation of single-pole switches on the neutral side was demonstrated in evidence given in a recent law suit at Liverpool Assizes. It was stated that the heater guard of an electric hair-dryer (which had no locking device) had come adrift, causing the element to come into contact with and adhere to the hand of the operator, causing a severe burn. The switch on the dryer did not cut off the current, owing, it was stated, to its being in the neutral, and also, presumably, to a leakage to the earthed frame. We have too often had to refer to apparent failures to realise the importance of wiring switches on the live pole. The present instance relates especially to portable apparatus, but the principle is of general application. The few cases in which trouble follows wrong connection nevertheless receive wide publicity, and do not increase public confidence in the safety of electricity that its record justifies.

Our Power Companies

The importance of the place that has been filled by the "big power companies," as we used to describe them, in the provision of Britain's electrical industrial power system, is not recognised as generally as it should be. The lengthy struggles in which their founders were engaged between twenty and thirty years ago are forgotten by many who are in the industry to-day, and to many more they have never been known. Some will remember how the proceedings before Parliamentary committees occupied many pages of the Electrical Review week after week, and year after year as various interests came forward to state their desires or to assert their claims to the accompaniment of much expert evidence. One could not help recalling these things and the old controversies concerning municipal *versus* private enterprise as one listened to the speeches delivered at the luncheon of the Incorporated Association of Electric Power Companies on Monday by Mr. R. P. Sloan. Mr. P. J. Pybus, Mr. W. B. Woodhouse, and Sir Edward Iliffe.

Security of Tenure

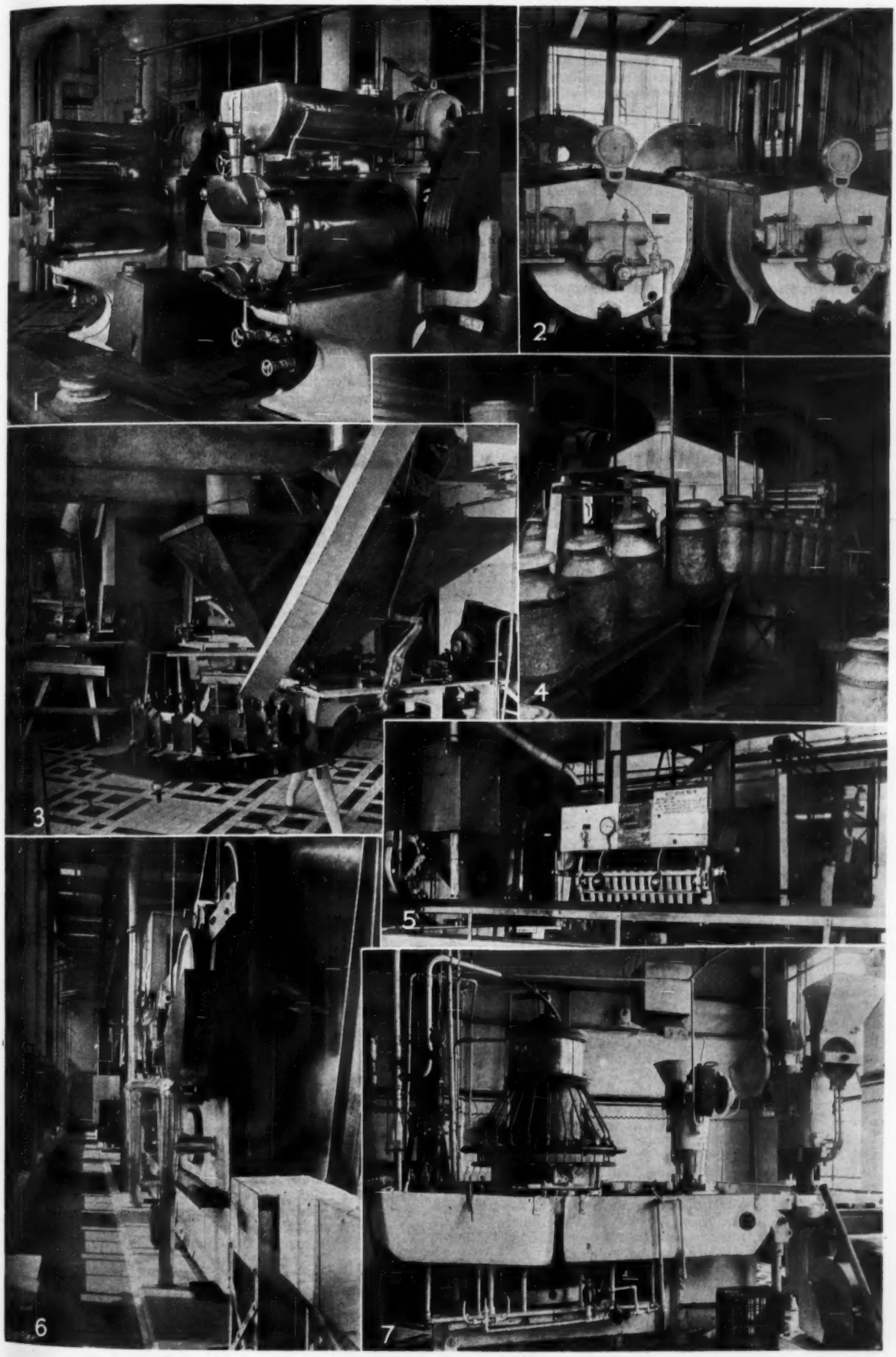
The necessity for a national distribution policy stares one in the face to-day. The power companies have more than justified their existence, and anything that tends to weaken their future position must be avoided. That they have reasons for the belief that there is a risk of their losing some of the ground gained through their persistent and enterprising policies, seems to be clear. It will be deplorable if—when we need a complete distribution system to bring electrical facilities within the reach of everybody—including dwellers in rural areas—the old battle of municipal *versus* private ownership or control should be revived, threatening the security of tenure of the power companies owing to doubts concerning terms of purchase of parts of their systems by municipalities. We venture to hope that it will be possible to negotiate this situation satisfactorily under the Electricity Commissioners and the Central Board.

Lighting in Schools

A resolution was passed at the National Union of Teachers' Conference at Folkestone that "there is room for great improvement in the standard of lighting in many schools, preferably by the provision of electric light." It is not often easy to trace direct results to propaganda, but there is surely some connection between this resolution and the development work for which the electrical industry has been responsible, together with the issue last year of reports on school lighting by the Illuminating Engineering Society.

Railways and Telephones

Reports have been received from France of severe shocks sustained by telephone operators and subscribers in districts where high-voltage transmission lines have been installed for railway electrification. The reasons for this are presumably that the telephone lines are too close to the power lines and are inadequately protected from inductive effects. No doubt means will be found to correct this defect in the communication system. There is, we believe, no likelihood at all of railway electrification, or of high-voltage transmission for any purpose, producing the same conditions in this country; our Post Office engineers are inclined to err on the side of playing for safety. Inquiries of engineers connected with railway schemes in the Dominions and other countries are reassuring, as troubles on a similar scale are unknown.



Electricity in the Dairy (*see next page*)

1. Ice-cream freezing machines. 2. Mixing and pasteurising vats; 1-h.p. motor driving agitators. 3. Automatic ice-cream filling machines. 4. Milk reception—can washer in rear. 5. Bottle-washing machine. 6. End view of steriliser (1-h.p. motor drive), conveyor in motion on the right. 7. Corner of bottling room; left, bottling machines; right, capping machines.

D

Electricity in the Dairy

Conditions favourable to both undertaking and consumer

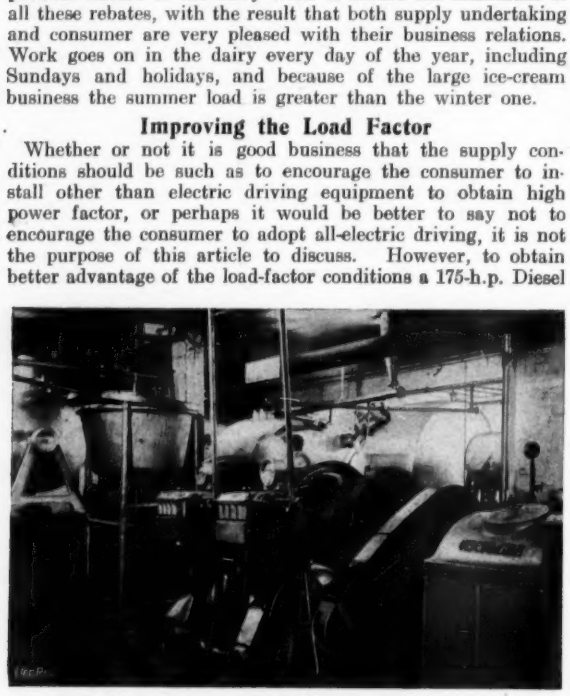
IT is probably not generally realised what a favourable load is offered to the supply industry by the large modern milk dairy, especially where the ice-cream business is catered for. On the other hand, it is only where an effort is made to devise supply tariffs and conditions scientifically that the dairy owner can be induced to use electricity to the full and to adjust his load to give the maximum advantage to the undertaking.

These points were evidenced during a recent visit to the new dairy in Corporation Street, Birmingham, of the Midland Counties Dairy, Ltd. About the first point to be stressed by Mr. R. F. White, the company's engineer, was the very reasonable tariffs and conditions under which the concern was supplied by the Birmingham Electric Supply Department.

The charge is 1d. per kWh, flat rate, with discounts for the following conditions: high load and power factors, high summer load, and week-end load. Advantage is taken of the peculiar nature of the dairy work to secure the maximum of all these rebates, with the result that both supply undertaking and consumer are very pleased with their business relations. Work goes on in the dairy every day of the year, including Sundays and holidays, and because of the large ice-cream business the summer load is greater than the winter one.

Improving the Load Factor

Whether or not it is good business that the supply conditions should be such as to encourage the consumer to install other than electric driving equipment to obtain high power factor, or perhaps it would be better to say not to encourage the consumer to adopt all-electric driving, it is not the purpose of this article to discuss. However, to obtain better advantage of the load-factor conditions a 175-h.p. Diesel



Motor-driven homogenisers

engine is installed to carry the refrigerator load during the day, ammonia compressors for this purpose being driven electrically at night.

Large quantities of l.p. steam are used for sterilising and pasteurising, &c., and in this connection also advantage is taken of the opportunity to improve the load factor, back pressure engines being used for a few drives throughout the dairy to lessen the day load. Generation on site because of the "process-steam" requirements is not regarded sympathetically by the company; it realises that generation of electricity is the supply undertaking's job, and believes rather in helping the undertaking to offer the best possible terms—a broad view which many industrial concerns could profit by adopting.

The annual load factor averages about 45 per cent. To obtain the discount offered for p.f. in excess of 0.95 there is installed a 30-kVA condenser by the Telegraph Condenser Co., Ltd. Supply is received at 5,000 V, 25 cycles, three-phase, from the Corporation's ring mains, and from the undertaking's panels in the consumers' sub-station on site, *via* oil switches, are fed two 200-kVA transformers for the 400-V power supply, and one 75-kVA transformer for the 110-V lighting. Low-pressure switches fitted with ammeters serve the distribution and auxiliary boards throughout the building.

About 600,000 kWh was consumed last year, and the maximum load was about 200 kW. There are something like 150 motors employed, ranging from ½ to 40 h.p.

Processes and Plant

Briefly, the essential dairy processes are as follows: Some of the milk is received from country creameries in 1,200-gal. transport tanks and is discharged into large storage tanks in the dairy basement. The majority, however, is received from farmers by lorry in 10-gal. cans which are unloaded on to conveyor elevators and raised to platforms where they are weighed before the milk is transferred to basement storage tanks. A continuation of the conveyor system carries the cans through cleansing equipment in which they are scoured by steam and water, emerging from the other end ready for return to the farmers.

From the storage tanks the milk is pumped, *via* a plate-type heat exchanger through which hot milk from the pasteurisers is also passed, into a second tank from which it is fed into homogenisers and then "lifted" to another tank before being conveyed to the bottle fillers. The homogenisers operate at 2,000 lb. per sq. in., and force the warm milk against an agate valve, thus splitting up the fat globules and permanently "fixing" the cream in the milk. Each homogeniser is driven by a 15-h.p. motor and will deal with 300 gal. of milk per hour.

Bottle Filling and Washing

On the filling machines the bottles are filled under vacuum. Each of these machines will deal with 6,000 bottles an hour and is driven by a 1 h.p. motor. The next operation is bottle sealing, conducted on rotary machines each of which will deal with 6,000 bottles per hour and is driven by a 1 h.p. motor.

The filled bottles are next conveyed to the sterilisers, huge metal enclosures in which, fully loaded, 800 dozen bottles of milk pass round in pans on a conveyor system driven by a 1-h.p. motor. The balance, up and down, at the ends of the conveyor explains the small driving motor; indeed, when the belt was removed from the driving pulleys, practically no difference was noticed on the ammeter on the starter. Completely loaded the whole steriliser weighs 100 tons. The whole sterilising process, which includes steam treatment and cooling, takes about two hours. The bottles of milk are unloaded from the sterilisers into trays and carried away on slat conveyors to the store room ready for dispatching.

The bulk of the business done is in sterilised milk, the output of which is round about 60,000 pints per day. In addition, about 18,000 pints of graded milk are sold per day, and this is subjected to similar treatment, except that it is pasteurised and not homogenised or sterilised. Bottle washing is, of course, an important operation common to both processes, and is carried out on machines operating on the conveyor system, each of which is driven by a 4 h.p. motor and deals with 6,000 bottles an hour.

Ice-cream Production

Ice-cream making is a comparatively simple process, the greater part of the electrical load being required for cold storage. There are three electrically driven ammonia compressors, each with a capacity of 25 tons and driven by a 40 h.p. motor. Milk, cream and sugar are mixed and some of the water is removed from the mixture in condensing plant. It is then homogenised, cooled and stored for a time, after which it is treated in ammonia freezers and passed to filling machines before being conveyed to cold storage for hardening ready for delivery. Each freezer is driven by a 7-h.p. motor and will deal with 100 gallons of ice cream per hour.

That standardisation in the driving equipment is carried out as far as possible was evidenced by the large number of 1-h.p. motors which we saw driving conveyors, filling machines, pumps, &c.

The Installation

Most of the company's motors are of Higgs Motors' manufacture and of the s.c. type with ball bearings. None of them is totally enclosed, the drip-proof construction having proved quite satisfactory. With d.c. in the old days the commutators were often found quite wet. Some of the larger motors were supplied by the British Thomson-Houston Co., Ltd.

The company is enthusiastic about the new "across the line" push-button starter supplied by Messrs. Donovan & Co., because of the enclosed thermal overload release. Unskilled operators often interfered with the old dash-pot release. All the starters are "water-proof" and fitted with ammeters, so that the manager can see what is happening on the motor circuit. Several starters by Messrs. Geo. Ellison & Co., Ltd., were also seen. Nothing but c.t.s. cable in galvanised conduit is used throughout the installation.

For retail house-to-house service the organisation has a fleet of eight one-ton battery vehicles (Electricars). They cover a distance of about 20 miles on one charge, and travel at about 12 miles per hour. The running cost is very small, they use about 1 kWh per mile, and the capital cost is the only drawback to what is otherwise considered by both management and men as ideal transport. There is a charging station on site equipped with a s.c. motor-generator set.

An egg-grading machine and incubators used in connection with the routine testing of milk for bacteria content in the laboratories may be mentioned as some of the miscellaneous electrical equipment seen during our tour of the dairy.

The Transport of Heavy Transformers

A labour- and weight-saving system

DURING the last few years the rapid increase in size of single transformer units has caused a radical overhaul of the means of transportation, both by road and rail. For either method, special vehicles have had to be constructed with a view, in the first place, to utilising to the full extent the available loading gauge, and, in the second place, to reducing the weight per axle to an allowable figure.

The former reason applies to both methods of transportation, while the latter applies particularly to road transport, and, even with the most modern vehicles, the heavy weight of the transformers frequently necessitates extensive detours in order to avoid over-bridges which cannot bear the load. With a view to reducing as far as possible the transport weight, a system is in use in America, and to some extent elsewhere, whereby the oil usually necessary to cover the windings is replaced by an inert gas, usually nitrogen. This method is, however, somewhat costly and has not been appreciably adopted in this country.

The Use of Dry Air

A further method is available which has all the advantages of the nitrogen-filling method, but avoids the cost and inconvenience of carrying a stock of nitrogen bottles. With this arrangement dry air takes the place of the nitrogen, and extended experience has proved that any transformer tank provided with an oil-tight cover can be filled in this manner and retain its air-tightness over a long period.

As compared with the transportation of transformers filled with oil, this method results in a considerable saving in transport weight, depending somewhat on the size of the unit, but amounting to some 20 to 30 per cent. of the total weight, with oil. The saving in weight reduces transport cost, and correspondingly increases the ultimate size of the unit which can be transported on road or rail. An additional, if minor, advantage of this method of filling is the reduced stress on the joints of the tank during transport.

The above advantages are equally applicable to transformers for export, so far as transport to the dock is concerned. Beyond that point, however, the advantages of the air-filling method become more marked. In addition to the reduction in weight, it is unnecessary to strut the cases containing air-filled transformers; this very materially reduces the shipping dimensions, and consequently the freight as compared with transformers containing oil. When compared with transformers and tanks packed separately, the advantage is, of course, still more marked, and possible damage to other cargo due to leakage of oil from the tanks is entirely eliminated.

Experience has proved that difficulties due to the variations in pressure in the tanks when passing through equatorial regions need not be feared, provided proper precautions are taken when filling the tanks at the works.

Drying-out Dispensed With

In this country it is not the practice to dry out transformers on site, owing to the facilities available for delivery completely dried out in oil, but, when transformers are delivered overseas for installation in outlying positions, it is frequently out of the question to deliver transformers filled with oil (apart from the economic aspects previously referred to) due to the lack of adequate transport facilities to the site. Under these conditions it is usual to dry out the transformers on site, which is generally inconvenient and not always satisfactory.

It is therefore in respect of such transformers that the full advantage of air-filling is obtained, both as regards saving in the cost of transport and installation, and the satisfaction of knowing that the transformers are being put into commission without any doubt as to their perfect dryness. As instances of the reliability of this method of filling, it might be stated that, among many others, 112 air-filled transformers were despatched by the Asea Electric, Ltd., from its factory at Walthamstow to Malaya, the whole of which were satisfactory on arrival. One only was dried out on site, as a matter of precaution, as the internal air pressure had fallen to ¼ in. on the gauge, but there was probably no real need for this to be done. After the transformers had been prepared, dry oil was pumped into them and they were put into service forthwith.

The Fuller Electric and Manufacturing Co. has delivered 42 air-filled, 15,000-kVA, 132-kV transformers for the C.E.B. grid system, and in every instance these were put straight into service after being filled with oil. The patents covering this method of filling transformers for transport are held by the A.S.E.A., but various firms in England, Europe and America have been granted licences for the use of the system.

A. CLIFFORD SMITH, B.Sc.

Some Driving Forces in the Industry

The personnel of Berry's Electric, Ltd.

1. Mr. H. H. Berry, chairman of the company (*Elliott & Fry*). 2. Mr. G. J. Berry, vice-chairman (*Elliott & Fry*). 3. Mr. A. Shelton, director and Manchester branch manager. 4. Mr. A. E. Ellis, secretary (*Mindel-Faraday*). 5. Mr. P. D. Morton, director

6. Mr. W. H. Hoare, manager, switchgear and wholesale departments. 7. Mr. N. Deykin, Midland sales manager. 8. Mr. C. A. Painton, London general manager. 9. Mr. W. J. Markham, director and Birmingham works manager (*Haskins*). 10. Mr. J. W. Reid, manager, Wembley works

Motors for Special Situations. By D. M. Cathcart, B.Sc.

Points to be observed in their selection

DUST, inflammable gases, and moisture are the three main enemies which the maintenance engineer has in mind when he specifies special machines.

By dust is meant matter in such a finely divided condition that it floats freely in the air. The following table shows the characteristics of the various types of dust and their common properties :—

Magnetic ..	—	—	—	Iron and steel.	—
Conductive ..	Coal and coke.	Graphite.	Bronze and aluminium.	Iron and steel.	—
Abrasive ..	Coal and coke.	—	—	Iron and steel.	Sandstone and emery.
Explosive ..	Coal and coke.	Graphite.	Bronze and aluminium.	—	Flour and starch.
Corrosive ..	Coal and coke (wet).	—	—	Iron and steel.	—

The magnetic type of dust has probably the most destructive effect on electric motors. The iron and steel particles settle on the motor windings and, being acted on by the flux, vibrate rapidly and eventually work their way through to the windings.

Conductive dusts are nearly as destructive. The particles settle on various parts of the machine or control gear and create leakage paths. Thus an arc may be drawn between the metallic parts and, although the conductive dust is soon burned away, the arc may continue until a breakdown occurs. A leakage path may be set up between the windings and the frame of high voltage machines especially, and if the motor is not properly earthed it is possible that the operator will receive a shock.

With abrasive dusts the fine particles, when drawn into the motor by the fan, pass over and scrape the windings, damaging the insulation in such a way that live metal is exposed and a leakage path set up. The bearings also suffer from such dust. Explosive dusts are not directly injurious except in d.c. motors where sparking may occur at the commutator, igniting the dust mixed with the air. This class of dust, unless blown out at frequent intervals, will fill the air ducts and cause the machine to run warm. Dusts of various sorts in chemical plants as well as coal and coke dust (which when dry are practically harmless as regards corrosion) become chemically active when damp and corrode the metals of the motor.

Motors in Dusty Places

There are two reasons for enclosing motors in dusty situations, first to protect the motor, and secondly to protect the main plant from explosion. Dust encountered in grain elevators, flour mills, starch factories, coal-handling plants, &c., when dry is extremely explosive, and open motors are impracticable in such situations.

The insulation used on the windings of normal motors is often sufficient for use in dusty places, but where extra insulation is required extra taping and varnish treatment are given. A hard, smooth glossy surface on which the dust cannot readily act is the ultimate aim. Rotors of squirrel cage motors are not affected, but wound rotors may be given extra dippings of varnish with caps over the end connections in order to preserve them from damage.

Gaseous Atmospheres

The principle of the selection of motors for gaseous situations is primarily to reduce risks to plant and staff. They must also be properly protected from destructive and corrosive gases. To-day explosion-proof motors are available for use in places in which volatile liquids, gases, or other inflammable substances are manufactured, handled, or stored. They should always be specified for such conditions.

Dampness in conjunction with dust will cause corrosion, set up leakage paths, and result in the breakdown of any motor which is not suitably protected. Extra insulation treatment is necessary, the object being to build up a continuous layer or seal over the windings to the exclusion of capillary passages.

Normal screen-protected motors are ruled out of court, but totally enclosed fan-cooled motors, in which the windings and other parts are protected from dust, are suitable. Pipe-ventilated motors are also used; a pipe is run to the outside of the building or to some other source of clean, dry air and circulation is maintained by either internal fans or a separate blower.

Motors for gaseous positions are in nearly all cases totally enclosed, fan cooled with ribbed frames, with broad machined joints and safety vents. They are designed to prevent any flame or heat from an explosion or any sparking inside the motor from igniting the surrounding atmosphere rather than to prevent the ingress of gas. Motors of this class are used in paint spraying cabinets, fiery mines, and petrol pumping stations. Open motors can be placed outside a fireproof wall and coupled to the plant to avoid the more expensive flameproof construction.

Steam and Vapour

When selecting motors for paper mills, dye houses, bleachworks, and the like, the problem is to avoid damage from steam and water vapour. Moisture is drawn into the motor through the air passages in the event of a shut down by "sweating"; the moisture usually contains enough salt or acid to make it conductive and also to attack the coverings of the windings. If the water gets through to the copper windings a creepage path is formed which leads to earthing. To take care of this problem a pipe-ventilated motor can be used which draws air from a clean, fresh, dry source.

Another solution is to provide a small heating unit in the base of the motor, so arranged as to be switched on when the machine is shut down. A very small heater will keep a motor dry and will obviate running it light for some time to dry it out when starting up after week-ends. If open motors are used in presence of excessive moisture, extra insulation is necessary. Former wound coils are provided with more insulation in the slots and additional tape is put over the end winding and treated with varnish.

Control Gear

This may be classified roughly as dust-tight, gas-proof, explosion-proof, and moisture resisting. For the dust encountered in normal service ordinary control gear is satisfactory. In places like steel mills, cement works, foundries, &c., dust-tight apparatus may be required. It is often possible to place the controller in a non-dusty situation and operate the machinery by push button; where the control gear must be placed in the dusty area, dust-tight equipment is necessary.

Equipment for motors in inflammable positions may be either: (*a*) Standard gear outside the danger area; (*b*) standard gear outside the danger area with explosion-proof push buttons; or (*c*) special explosion-proof gear with broad machined joints.

Oil immersed control gear of standard pattern with sufficient head of oil can be used, provided glands and cable boxes are fitted. Where large control panels are used it is best to place these in a separate room. Most modern control equipment is sufficiently enclosed to be moisture proof, but if excessive moisture is present the control may be situated in a separate room with push-button starters.

To-day there seems to be little or no excuse for not utilising suitable enclosed motors and control gear for dusty, gaseous, and damp situations, as the totally enclosed fan-cooled motor is now widely manufactured and in price and size compares well with a similar open-type machine.

A Public Mains Clock

The synchronous electric clock is not confined to the domestic market, as will be seen from the accompanying photograph of the Hampstead town clock, which has recently been converted to synchronous drive, the old pendulum mechanism having been removed and replaced by "Synclock" motors wired to the a.c. circuit. As the timekeeping is now regulated at the power station by an Everett Edgcumbe Synclock master frequency meter, checked by wireless time signals from Greenwich Observatory, a very high standard of accuracy may be expected.

Mains-operated clock at Hampstead

The "Synclock" motor has a high-speed rotor running at 3,000 r.p.m. and is able to drive clocks of the largest size. The space occupied by the complete movement is practically negligible, leaving clear room in the clock chamber for lift-winding gear, water tank, or similar adjuncts to modern building equipment. The contractors for the wiring were Messrs. C. E. Keates, Hendon.

The E.A.W. Conference

THE seventh annual conference of the Electrical Association for Women was held on April 14th and 15th. The proceedings opened on Thursday morning at the Dorchester Hotel, London, W. Lady Moir, O.B.E., was re-elected president, and Catherine Countess of Westmorland and Dr. E. Sloan Chesser were elected vice-presidents. Mrs. Paterson and Mrs. Rendell Baker were appointed members of the Council.

Lady Moir presented the first diplomas in electrical housecraft to women who had qualified in salesmanship and as demonstrators; 104 diplomas were awarded by the committee, of which Mr. R. S. Downe is chairman. Lady Moir also presented Mrs. Ll. B. Atkinson with the first president's cup for securing the greatest number of new members (106) during the year.

She stated that the diplomas were instituted after a conference between representatives of electrical and educational interests. The committee had also drawn up a syllabus of training, and had sent out inquiries to showrooms everywhere to ascertain the number of women employed and the names of those prepared to train women. Replies indicated that the electrical industry considered the scheme of the greatest importance. She believed that some scheme of training should be put in hand forthwith.

The Official Luncheon

The luncheon which followed was attended by some 700 members and guests. Apart from the speakers, those present included Mr. and Mrs. Ll. B. Atkinson, Sir John and Lady Brooke, Catherine Countess of Westmorland, Capt. J. M. Donaldson, Mr. J. C. Dalton, Mrs. S. Z. de Ferranti, Mrs. Gresham, Mrs. Frank Hodges, Lord Meston, The Lady Mount Temple, Lady Vansittart Neale, Mr. and Mrs. Morley New, Sir Archibald Page, Dr. E. Sloan Chesser, Mr. R. P. Sloan, the Viscountess Snowden, the Dowager Lady Swaythling, Mrs. Woodhouse, and Mr. Raymond Unwin (president R.I.B.A.). Another guest was Col. R. E. Crompton, whom all were glad to welcome after his recent illness. It was pleasing to note also the presence of the former Minister of Transport, the Rt. Hon. Herbert Morrison.

The toast of "Electricity in the Service of the Community" was proposed by Mr. P. J. Pybus, M.P. (Minister of Transport), who referred to the rapid progress made by the E.A.W. There was, he said, a real opening for a body which could consolidate and focus feminine attention on certain aspects of electrical development. Men often had the idea that it was beneath their dignity to sell anything that weighed less than a ton. The founders of the E.A.W. had realised that there was a vocation open to women in the sale of electrical appliances for the home.

Women and the Grid

The setting up of the Central Electricity Board and the approaching completion of the grid had transformed what appeared seven years ago, when the Association was formed, as a promising opening for women into an established vocation of national importance. The grid schemes and the schemes for the rationalisation and distribution of electricity were more ambitious enterprises than had been attempted in any other part of the world; they had made the rapid growth of the domestic use of electricity of vital importance. Women must play their part if the capital invested in the grid was to fructify.

The Viscountess Snowden seconding, said that over four and a-half million homes were equipped with wireless; she hoped all would soon have opened to them the world of culture made possible by this means.

Mr. Frank Hodges, proposing the toast "Electrical Education," described himself as a substitute for Sir Hugo Hirst, Bt., who had been prevented by illness from being present and speaking, as he had intended. He said that the E.A.W. existed for electrical education, especially in the domestic sphere. He referred to the brilliant organising and educative genius of Miss Haslett, and said that if the minds of the young were trained to appreciate the value of electricity as the most potent agency for relieving drudgery there need be no fear for the future.

Public opinion would require the price of electricity and appliances to be brought within the compass of the working class budget. In Scotland there had been a heavy decline in the industrial consumption of electricity, but every report for the last three months showed that the increase in domestic consumption had very nearly compensated for this.

Lady Moir, O.B.E., seconded the toast. She announced that the invitation of the Birmingham and Midlands Branch to hold next year's conference in Birmingham had been accepted. Referring to the diplomas, she credited Mr. R. W. Kennedy with the suggestion last October that a standard of electrical knowledge on the part of demonstrators would improve their status and make them more useful to their employers.

The afternoon was occupied in receiving reports from the local branches. In the evening a reception took place at the Institution of Electrical Engineers, followed by a lecture by Sir Wm. Bragg on X-rays. In support of his thesis that Nature preferred order, Sir William concluded his lecture by demonstrating with the aid of models how crystals were built up.

At the E.A.W. Conference Luncheon

(1) Mr. Frank Hodges and The Lady Mount Temple. (2) Mr. Raymond Unwin (Pres., R.I.B.A.), the Dowager Lady Swaythling, Sir Archibald Page. (3) Mrs. Frank Hodges. (4) Col. R. E. Crompton. (5) Dr. E. Sloan Chesser. (6) Capt. J. M. Donaldson and Mrs. Woodhouse. (7) Mr. P. J. Pybus and Lady Moir. (8) Mr. R. P. Sloan. (9) Catherine Lady Westmorland.

Works Visits

On Friday the members were taken by coach to the Erith works of Callender's Cable & Construction Co., Ltd., whose jubilee week it happened to be (Elec. Rev., April 8th).

After a tour of the works, the visitors were taken to lunch, which was preceded by a short speech by Sir Tom Callender, who had come to the works for the first time for many months after his recent illness to welcome the members of the E.A.W. Among other speakers at the luncheon were Lady Callender, Lady Moir, and Miss Haslett.

The whole party then went to the high-voltage test room, where miniature lightning and the effect of salt spray on insulators were demonstrated in a darkened building, after which Sir Archibald Page, chief engineer of the C.E.B., lectured on "From the 'Grid' to the Home."

There was, he said, still scope for further reduction in cost of electricity which could be effected when the demand increased; at the present time only 65 per cent. of the machinery in the British Isles was electrically driven and only four and a quarter out of every eleven potential consumers had electricity.

A party of members also paid a visit to the Fraser and Chalmers Works (G.E.C.) at Erith.

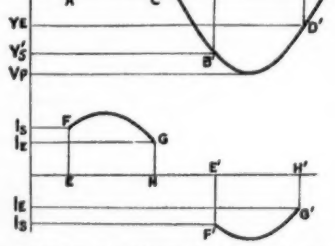
The ball at Dorchester House on Friday evening was, as in previous years, a brilliant and enjoyable function, with the special atmosphere of its own that has come to be associated with it. The revenue from the ball will be added to the "New Premises Fund."

Neon Tube Lighting (From a Correspondent)

Characteristics, application, and load effect on installation

VARIOUS gases are used besides neon in the so-called "Neon tubes." In manufacture each end of the tube is fitted with electrodes made from high conductivity metal, *e.g.*, copper, nickel, or iron, bared inside the tube and heavily insulated outside, into which the necessary wiring conductors are securely fitted or welded.

All air is then exhausted from the tube, and any extraneous matter which may have clung to the walls of the tube or the interior electrodes expelled. After drying out, the required gas is pumped in at a predetermined pressure, and allowed to saturate. Neon gas itself produces the familiar red glow when lit, whilst argon, though not of any commercial value, owing to its poor luminosity, shows as faint lavender. Helium gives off a whitish glow, but is not so efficient and is more expensive than neon. Gas forming on discharge primary colours might be proportioned to produce a white light, without utilising the other colours formed by the spectrum. By mixing mercury and argon a blue glow is obtained, this and the colours previously mentioned being used with ordinary glass tubing. If a combination of argon and mercury gas is used in a yellow glass tube, the resultant luminant will be green, whilst to obtain an indefinite fluorescent outline uranium glass may be substituted.



Relation of voltage and current in a G.E.C. neon tube

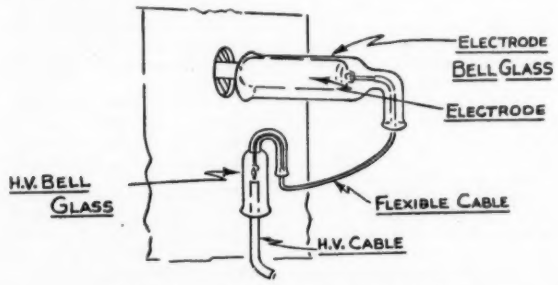
Operation Characteristics

The properties of all these gases are such that once luminosity is established, by the flow of current in the tube, they will continue to glow, or discharge, at a much decreased e.m.f. with a minimum of current.

Standard low voltage a.c. systems will not provide a high enough e.m.f. to produce this desired condition for commercial installations, except with small lengths of gas-filled tubing.

Due, therefore, to the inherent properties of these gases, a step-up transformer is employed for this initial "striking," but the voltage required to maintain satisfactory running conditions is only about half that needed initially.

In consequence of this the current wave does not fill the whole of the sine wave curve, as it commences late and finishes early, as shown in the diagram. The current will, therefore, have a tendency to rise, so that any high-voltage system used in conjunction with these tubes must be such as to limit it immediately after the luminous condition has been obtained, otherwise the tube would be destroyed. The necessity for such a current limiting device in the circuit requires either the introduction of choke coils on the primary or secondary side of the transformer, or the use of a stray-field transformer as a means to attain this end.



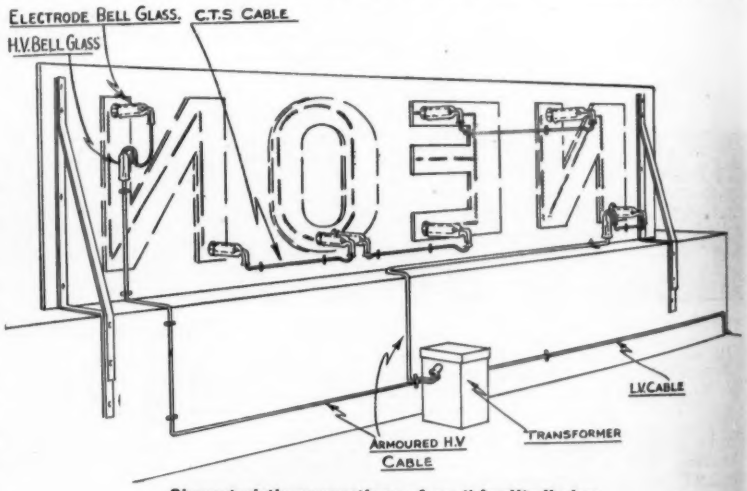
High-voltage connections of neon tubing

The neon circuit has a low power factor. In the accompanying illustration are shown the voltage and current characteristics of a neon tube in their relation to a complete a.c. cycle during the establishment of luminosity in a neon tube, and subsequently behaviour. In the top portion, AB-V'S represents the striking pressure, and CD-VE the extinguishing pressure in each half cycle. The current suddenly rises to a value IS-EF, correspondingly at the striking value V'S. Then follows the path shown as FG, until reaching IE, when it instantaneously falls to zero, as indicated by GH, corresponding to VE, the extinguishing pressure. Luminosity ceases between the points D and B_1 in the curve, but on the latter being reached, the sequence is repeated, the current in the tube passing in the opposite direction IS-E'F' to IE-G'H'.

Effect of Power Factor

As the input of the tubes is low, they do not have any material effect upon any distribution system, unless the loads are in sufficient quantities to produce a considerable sum total. An average installation has a p.f. of from 0.4 to 0.5, dependent upon the design, whilst its input may vary from 0.25 kVA for a shop window panel up to 3 kVA for a lettered sign or window frame. In the case of theatres the total sign load may not exceed 10 kVA out of 150 kVA required for the whole building. Compared with induction motors frequently of larger size, whose power factor may not be above 0.6 or 0.65, the adverse effect of signs may be treated as negligible. A condenser would raise the power factor, but it would increase the cost by approximately 5 to 7½ per cent. An E.D.A. Committee is now considering this subject.

The transformers used for stepping up from the public supply must be totally enclosed, preferably of the oil or compound-filled type, with terminals suitably shrouded. As they are placed adjacent to the tubes on the consumer's premises, care should be taken of the means of connecting up the h.v.



Characteristic connections of an "Ionite" sign

side with heavily insulated weatherproof cables. Certain local rules apply as to the secondary or high-voltage side, but 10,000 and 5,000 V are in common use, and so provided reasonable precautions are taken against interference by unauthorised persons and suitable notices posted no danger exists.

Transformer Requirements

No definite rule can be applied to the number of transformers to be used on any display, for questions of voltage drop have to be considered in conjunction with other factors. In the case of a straight tube, one transformer may suffice for every 15 to 20 ft. of tubing. Signs differ in form and size, so that the sectionalised circuits are divided to suit individual requirements. In this connection it is advisable to have section fuses to localise faults, besides a main switch on the l.v. side. Technically speaking, there is no reason to limit the secondary voltage to the figures given above, but the initial pressure required precludes the commercial use of d.c.

Small signs are usually self-contained, and those above shops are either encased in their own frame work or the separate letters are affixed to a base. In London to-day may be seen signs of the latter type, with bare interconnecting loose wiring flapping in any wind in dangerous proximity to the metal framework of the shop window and facia. In such cases it would be as well if the electricity undertakings were to include a periodical inspection of all signs to detect such defects, in addition to the inaugural inspection before making the in-

(*Continued on opposite page*)

A Parisian Palace of Electricity

IN the centre of Paris there has gradually grown a palace of electricity. It is only a few weeks since the "Secteurs de la Région Parisienne" opened this home of electrical propaganda, and already it has borne fruit, for every day the public throng to witness the new wonders of electricity.

The whole object of the Office Central Electrique ("O.C.E.L.") is to bring the public into contact with the companies who serve them with power in their own homes. Here they can see exactly what is new, and apart from demonstration halls and showrooms, there are also sale rooms. The companies maintain that they do not intend to become competitors of the Parisian electrical dealers; the main object is to demonstrate, though, of course, a sale is not refused.

The building itself is sufficiently imposing to attract attention. Designed after the same style as that employed in the Colonial Exhibition and the Decorative Arts Exhibition, it is modern, and expresses, above everything, progress.

The façade is 80 metres long, and is composed of thirteen show windows displaying, in modern settings, the latest domestic electrical apparatus. Each window is devoted to one special use of electricity—power, lighting, kitchen utensils, heating, refrigeration, wireless, &c. The exterior is illuminated by neon gas in tubes amounting to 800 metres in length. These tubes are alternatively blue and rose, giving an ensemble of mauve which is intense and attractive.

The sales rooms and showrooms occupy four floors, two of which are situated in the basement. In the interior every effort has been made to produce a lighting effect as nearly as possible resembling daylight, by the use of luminous walls 3.25 metres high. These walls are lighted by a device evolved by M. Georges Claude, which consists principally of a set of rare gas tubes and of mercury vapour tubes of different colours which collectively give a light approximating to white light.

An air purifying apparatus has been provided comprising a filter chamber with oil filters, heating or refrigerating apparatus according to whether it is desired to have a temperature higher or lower than the outside temperature, and an air-conditioning room equipped with water sprays. The air treated in this manner is forced into the hall by means of a powerful fan, while the foul air is drawn up and discharged outside. It is estimated that the air in the hall is completely renewed in eight minutes.

The display of appliances is divided into two sections. The first consists of specialised apparatus for lighting, heating, cooking, cleaning, ventilation, refrigeration, wireless, medical and beauty treatment. In the other section the various

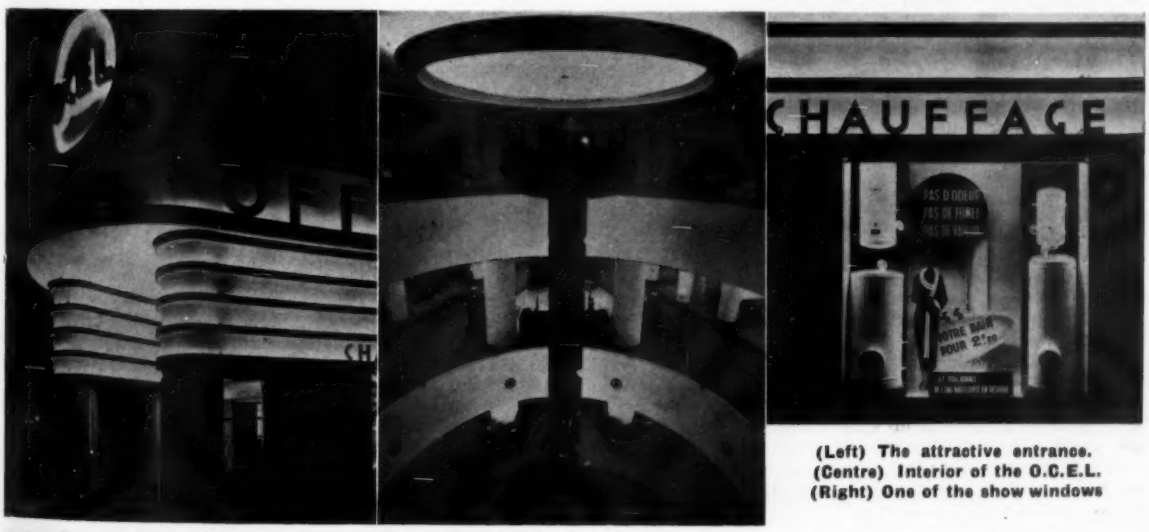
The tea-room at the O.C.E.L.

appliances from the first part can be demonstrated. For example, a large kitchen has been constructed in the basement where cooking demonstrations are carried out; there are also laundry demonstration rooms amongst many other apartments.

The capacity of the transformer sub-station supplying the building is 2,000 kW. The lighting of the façade uses 176 kVA, the shop-windows need 65 kW, an inside luminous partition 80 kVA, and an illuminated fountain 8 kW. The temperature regulating equipment requires 250 kW, the demonstration kitchen 51 kW, and the laundry 8.5 kW.

In order to interest the feminine *clientèle* and to encourage them to visit the O.C.E.L. two attractions have been added—an up-to-date tea room, and a cinema. The latter has 120 seats and is equipped with all the latest improvements in lighting and acoustics. The films shown consist mostly of news reels, and not electrical demonstration pictures. The programme lasts about 50 minutes, and a small entrance fee is charged.

It is stated that already 75 per cent. of the inhabitants of Paris and the Seine district are users of electricity, and the object of the "Secteurs de la Région Parisienne" is to bring the public into closer contact with their supply authorities to the mutual benefit of both parties.



(Left) The attractive entrance.
(Centre) Interior of the O.C.E.L.
(Right) One of the show windows

Neon Tube Lighting (*continued from opposite page*)

stallation alive. By-laws exist as to the projection of such signs over the public thoroughfares, but they should also be maintained for the protection of the public.

In the case of a 1,500-V traction scheme, this voltage might be utilised to indicate the names of stations or other signs, but in the ordinary situation, where a consumer is on a d.c. supply, a rotary convertor must be installed, together with the essential apparatus. Other methods of conversion have been tried, but have not proved satisfactory owing to their lack of stability and durability.

The particularly penetrative rays of these types of gases are very suitable as ground signs for aerodromes. An airman flying above an aerodrome which was enveloped by fog stated that he was able to pick out the design of the neon tube ground beacon as it was clearly indicated on the top surface of the fog layer, although he was unable to discern the source.

All neon tubes are cold illuminants, and such rapid development is being made that white light is obtainable, but so far no notable progress has been made towards using it as a medium for public lighting owing to the high initial voltage required for striking.

At the same time, research work carried out in connection with the discharge of gases in tubes has led to interesting experiments in which hot thermionically emitting electrodes have been substituted for those described above. With tubes of this pattern it has been found that the ordinary working voltage will suffice to create and maintain illumination. It remains, therefore, to develop these to give a white light with high efficiency on a commercial basis.

Already a mixture of neon and mercury, in a tubular fitting, has been made, emitting a white light at a higher efficiency than an equally rated tungsten lamp. This type of light is understood to possess the same inherent characteristics as those attributed to the cold neon tube pattern.

Earthing in Rural Areas. By T. C. Gilbert, A.M.I.E.E.

"Artificial" systems more reliable than "natural" means

IN country districts the great majority of earth connections are distinctly bad. Earth connections must be improvised, *e.g.*, by burying various objects in the ground, which may range from standard earth plates to burnt-out firebars. (See ELECTRICAL REVIEW, March 18th.)

The first essentials of efficient earth connections are low resistance and heavy current-carrying capacity. These are adequately provided in urban areas by large water systems or cable networks which are non-existent in rural areas, small local water systems not being satisfactory.

Earthing has now been abandoned as a safety measure in rural areas by leading supply authorities on the Continent, some of which have been concerned with extensive rural developments for over a quarter of a century.

Mr. T. C. Gilbert has made a special study of earthing problems

It is proposed to confine attention to the low-voltage side, where earthing has usually been employed for the safety of the consumer, in which connection the neutral line and the pole-top metal fittings (normally connected to buried earth plates) must often be taken into account.

Reasons for Earthing

The object of earthing is to prevent the appearance of potentials upon connected apparatus, as high as 40 or 50 V. Where comparatively high fault currents are likely, even of the order of between 20 and 50 A, any resistance in the earth circuit approaching 2 to 3 ohms must result in the appearance of a high potential upon the earthed apparatus.

It is generally assumed that the high potential can be present only until the faulty line or appliance is isolated by means of the overload devices; a very small increase in the earthing resistance, however, prevents the fault current growing into an overload, and the high potential must therefore persist indefinitely upon the connected apparatus and throughout the earth circuit. To take a simple instance, on a supply system at 230 V to earth, with a circuit protected by fuses rated at 25 A, requiring about 60 A to cause them to melt, any resistance in excess of 4 ohms will effectively prevent isolation of the circuit. This ignores any reactive or inductive effects in the lines or installation, which must tend to reduce the fault current still further.

In towns, good earth connections can be made to water systems with resistances well below one ohm, but it is impossible to secure earth connections of such a low value in rural areas. Allowances are made in several standard sets of regulations to meet the conditions; for instance, New Zealand permits up to 10 ohms for neutral-line earth connections, and Canada and America up to 25 ohms, but such regulations are completely ineffective as safety measures.

Ohmic resistance alone does not indicate the value of an earth connection; equally as important is the question of *heavy current-carrying capacity*.

Tests on Earth Plates

The resistance of earth plates (usually of iron 12 or 18 inches square) often exceeds 200 ohms, and is rarely below 50 ohms. Investigation of the problem was made some two or three years ago by the National Physical Laboratory at Teddington. The smallest plates used in these tests were 36 in. square (four times the size of the plates generally used on rural schemes). Assuming the 36-in. plate to present an area of 18 sq. ft. in contact with the soil, the standard 18-in. plate would present only 4½ sq. ft., or one quarter, and the 12-in. plate only 2 sq. ft., or one ninth.

About 40 plates of varying sizes were used during these tests, which were carried out for one year in order to take advantage of any seasonal variation. It was established that the mean resistance of the 36-in. plates was at 3 ft. deep, 39 ohms, and at 6 ft. deep, 24 ohms. Plates 6 ft. square, 3 ft. deep, gave a minimum resistance of 20 ohms, whilst the largest plates tested, which were 9 ft. square, showed a mean resistance of 9 ohms when at 6 ft. In no case of connection of two plates in parallel, buried at a depth of 6 ft., each plate being 6 ft. by 3 ft., and at varying distances apart, was a lower resistance than 9 ohms recorded.

The values quoted above are the mean, and although slightly lower values were occasionally noted, yet for quite long periods during the year the resistance of an electrode was three or four times the mean value. The lowest value recorded for any plate of any size tested at any time was 8 ohms, although the high values reached 70 and 80 ohms, and this for plates four times the size of the larger standard earthing plate.

The valuable data collected during the tests were incorporated in an I.E.E. paper by Mr. P. J. Higgs*. The results prove that the ordinary iron earth plate, or any equivalent device, is completely useless as an earth connection.

The use of driven rods, 10 ft. long and ¾ in. in diameter, instead of plates for earthing has been considered. The conclusions reached were that if the resistance of a single rod were 100 ohms, then 40 rods spaced 5 ft. apart would present a combined resistance of 14.5 ohms; 10 ft. apart 8.5 ohms; 20 ft. apart 5.5 ohms; 30 ft. 4.5 ohms; 40 ft. 4 ohms; and 100 ft. 3 ohms.

These figures indicate the great amount of trouble necessary to construct an earth connection that shall really be of use.

Effect of Heated Soil

It is maintained by distribution engineers upon the Continent, although many British authorities disagree, that heavy currents flowing over ground electrodes cause their resistance to rise, probably due to heating of the surrounding soil. My own tests tend to confirm this view, and 1 A must be considered a heavy current for a 10 ft. by ¾ in. rod; if rise in resistance of the electrode is to be kept within reasonable limits, the current should be kept down to 0.25 A per rod, which will necessitate about 160 rods being used.

This tends to show the great importance of high current capacity in ground electrodes in addition to low resistance; the value of 0.25 A is based upon a chart compiled by a West German company which shows that a current of 1 A over a 1-in. pipe, with 11 ft. driven in the ground, caused a rise in resistance in one hour from 90 ohms to 420 ohms.

These considerations show that it would be optimistic to assume a resistance of 40 to 50 ohms for a standard earth plate. It must further be remembered that *two*, at least, of these high-resistance earth connections will always be found in any earth circuit in country districts, one earthing the pole fittings or the consumers' apparatus, and the other the neutral point at the transformer; these two resistances should be taken as being in series in calculating likely earth currents. It will be clear that these combined high resistances, varying between 50 and 100 ohms even under favourable conditions, and of infinitely higher values in rocky or sandy soils, must be completely useless for the protection by earthing of any portion of the distribution system or consumer's installations.

Resistance of Steel Structures

Steel line supports are sometimes put forward as eliminating earthing troubles. It was found during recent research into lightning troubles with overhead lines in America that the resistance of even large structures of steel to earth was often of the order of 30 to 40 ohms. High resistances of this value proved fatal to efficient protection from lightning, and great expense was incurred in getting these resistances down to about 20 ohms—the maximum permissible.

These structures were much larger than the small steel poles used in this country for low-voltage work, and as the resistance to earth of the latter must be at least comparable to that of a pipe of 6-in. diameter, buried in the ground to a depth of 6 ft., their resistance would not be lower than about 60 ohms under favourable conditions.

Even many of these pole-earth resistances in parallel—and they can only be considered as in parallel if there is a continuous earth wire connecting the poles together, which is rare for low-voltage distribution—will not ensure a combined low resistance, as *earth* resistances in parallel do not follow the general rule for resistances in parallel. This is clear from the foregoing consideration of rods in parallel, whilst if the poles are considered as separate earth plates then obviously they have no greater value than a plate, if as much.

Formation of Potential Gradients

Assuming, therefore, a very optimistic total of 30 ohms for any possible combination of earthing resistances in rural areas, it will be clear that, with a supply pressure of 400/230 V, fault currents flowing to earth from pole fittings, consumers' installations, or even from a broken overhead line

* *Journal*, I.E.E., June and October, 1930.

fallen on to some earth-connected object, cannot possibly exceed 8 A—too low a value to effect isolation of the faulty line or apparatus, but sufficiently high to set up dangerous potentials upon the connected gear and at earthing points.

Continental experience in rural electrification has shown that fault currents flowing to earth without effecting isolation of the faulty circuit give rise to potential gradients of varying magnitude upon the earth's surface. These gradients proved to be a prolific source of accidents to horses and cattle grazing in the vicinity of poles upon which leakage was occurring, due to broken or faulty insulators. Further investigation showed the extreme susceptibility of animals to potentials of very low value, even 15 to 20 V apparently being fatal in some cases; earthing to plates buried in the ground has now been abandoned in many instances for this reason alone. A case was reported fairly recently of a valuable horse being killed by coming within the area of a potential gradient due to a fallen low-voltage neutral line lying across the iron fence surrounding the field; the man leading the horse into the field experienced only a very slight shock.

Inadequacy of Water Pipes

Even apparently good earth connections are not above suspicion in country districts, as is shown by the following occurrence, which took place upon a farm in the west of Germany.

In this installation the metallic sheathing of a cable was earthed to a water-pipe, which was connected to a fairly extensive water system all over the farm (including two pipes from pumps into deep wells) and entered the ground in a stable. A breakdown in the installation caused the cable sheathing and the water-pipe to become alive, but, owing to the comparatively high resistance of the pipe to earth, the fault current was not of sufficient magnitude to blow the fuses. A potential gradient arose around the point of entry of the pipe into the ground, and six cows, although not anywhere in contact with live metal, were killed simply by coming within the area of this potential gradient, while workers on other parts of the farm, in the vicinity of stand-pipes, received shocks.

Immediate investigation showed the earth resistance of the water pipe to be about 30 ohms, which had fallen next day to about 6 ohms. The fault occurred on a motor that was protected by a 25-A fuse, the supply pressure being 220 V; the resistance of 6 ohms in the earth circuit effectively prevented isolation, which would have required a current of about 50 A. The high value of the earth resistance immediately after the occurrence was no doubt due to the flowing of the fault current for a fairly long period. The motor did not require a 25-A fuse for running, but it was operated by a direct-on-line starter, a type common on farms in this country.

"Artificial Earthing"

As high potentials can easily be extended to all apparatus connected to the earth circuit for protection when immediate isolation is not effected, and, what is worse, to all non-electrical gear in contact with the earth system (*e.g.*, water pipes and taps, iron fencings, steel framework of buildings) throughout the whole installation, the question is not whether earthing in rural areas is worth the expense involved, but whether it should not be prohibited.

Upon all distribution systems and installations of the Rheinische-Westfalisches Elektrizitätswerk, of Essen, protection against leakage potentials by means of "artificial earthing" has been compulsory. This protection is applied to the neutral of the four-conductor 380/220-V overhead lines, and also to installations and individual appliances, and to every point normally protected by earthing in this country. The impossibility of securing low-resistance earth connections has been realised, and the new form of protection has been devised for efficient operation against earth resistances not only of the order of 200-500 ohms, but even up to the unusual value of 1,500 ohms. It is held that lower resistances than about 200 ohms should not be counted on, unless constructed at an expense too great for rural schemes.

Artificial earthing having been in successful operation for seven or eight years, it is past the experimental stage; moreover it permits the safe use of a cheaper and inferior type of installation. Even protection by neutralisation, otherwise dangerous, due to its dependence upon the efficient earthing of the neutral line, can be safely permitted when the neutral line is artificially earthed by the special means provided.

How the System is Applied

Briefly, the protection is afforded by the use of special devices for the sub-station and the installation; these take the place of the switches normally used, but they are fitted with trip-coils responding to low-leakage currents. The sub-station switch, for instance, will isolate the lines upon the potential of the neutral line exceeding a pre-determined limit, usually 42 V; a current of 15 mA is sufficient to do this, and it will flow against an earthing resistance of 500 ohms.

For the installation, main switches are used fitted with similar trips, with or without overload protection in addition. These trips respond to a leakage current of 25 mA, against high earthing resistances, and the devices are used by the supply authority to terminate their services, whether overhead or underground. For the individual apparatus there is a special motor switch, with thermal and rapid overload devices, and a leakage trip similar to that described above; also a switch-socket for single or three-phase apparatus up to 15 A.

In every case a test of the switch mechanism and the continuity of the earth circuit can be made immediately by pressing a button provided either upon the protected apparatus or incorporated in the protective device; in the case of the motor switch and the switch-socket, this test of the earth circuit is *automatic*, immediate notification being made of any fault or disconnection.

Small-current Devices

The requirements of the power company for systems of artificial earthing are as follows: "With a resistance of about 200 ohms in the artificial earth circuit the automatic switch shall trip at a (leakage) potential of 20 to 24 V; with resistance of 500 ohms in the artificial earth circuit the switch must trip at a (leakage) potential of less than 42 V."

With this protective system the earth connection can be as bad as possible; indeed, a simple driven pipe or rod is adequate for complete protection. Leakage protective systems on farms can be kept clear of all water systems, &c., which can lead to all sorts of troubles, whilst each appliance can be supplied through the appropriate device and earthed to its own small rod or pipe driven nearby, eliminating dependence upon a central earthing system.

These protective methods can also be applied to the consumer's appliances even where the neutral is unearthed.

Installations may be modified and cheapened by the use of artificial earthing to an extent which will more than offset any slightly increased expense in the protective devices. Even if installations are left as at present, comparative economies can be effected by eliminating earth connections with elaborate routine tests, continuous earthing systems, &c.

Some of the first hundred demonstrators to receive the E.A.W. diploma

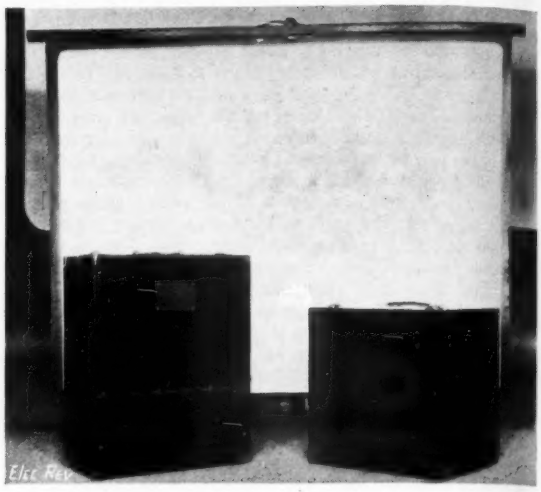
Home "Talkies"

A small portable sound-on-film outfit

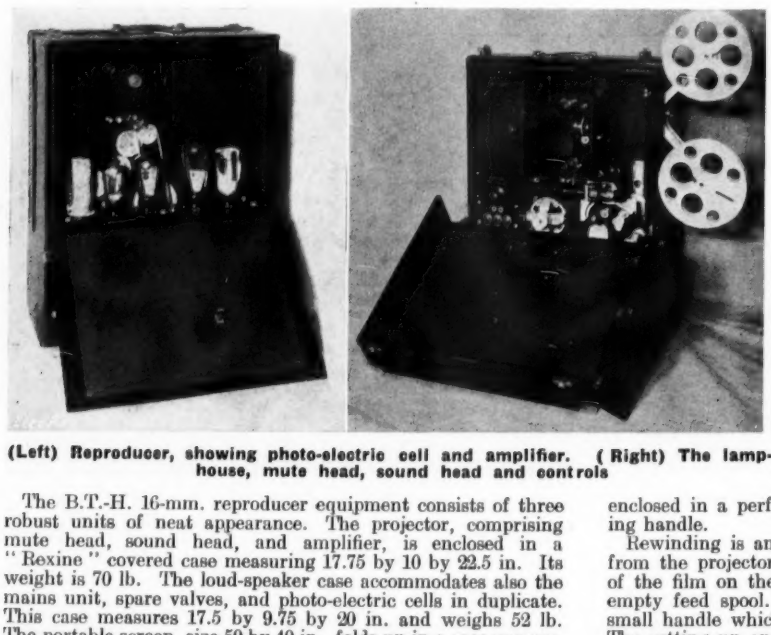
THE first talking picture equipment installed by the British Thomson-Houston Co., Ltd., was put into operation in November, 1929. Since then nearly 700 British cinemas have been equipped with B.T.-H. apparatus, and from the company now comes a home talkie equipment which operates on exactly the same principles as public cinema equipment, and gives the same high standard of reproduction, but is accommodated in two cabinets which can easily be carried by one man.

The sound-on-disc method is now seldom used in cinemas, the standard system being sound recorded as a variable wavy line on, or a variation in density of, a narrow strip of film 0.07 in. wide at the side of the pictures, the width of the film being 35 mm. or 1.38 in. For this home talkie outfit, however, 16 mm. or 0.63 in. film is used with a sound track 0.055 in. wide, and the equipment has been reduced to quite small size and weight without interfering with ease of manipulation.

The usefulness of the equipment is naturally dependent on the availability of a good supply of suitable " non-flam " films, and not until this year has it been found possible for this condition to be met in a satisfactory manner. With this question settled, manufacture has been commenced, and as the value of the cinematograph for educational and propaganda purposes as well as for entertainment is firmly established there can be no doubt but that an equipment giving the added advantages of synchronised sound will be sought after. The business man, too, will appreciate this potential means of putting his wares before his clients in an attractive fashion. Not only can salient features be portrayed and described, but important details of the manufacturing process can be emphasised on the spot.



The complete equipment



(Left) Reproducer, showing photo-electric cell and amplifier. (Right) The lamp-house, mute head, sound head and controls

The B.T.-H. 16-mm. reproducer equipment consists of three robust units of neat appearance. The projector, comprising mute head, sound head, and amplifier, is enclosed in a " Rexine " covered case measuring 17.75 by 10 by 22.5 in. Its weight is 70 lb. The loud-speaker case accommodates also the mains unit, spare valves, and photo-electric cells in duplicate. This case measures 17.5 by 9.75 by 20 in. and weighs 52 lb. The portable screen, size 50 by 40 in., folds up in a case measuring 52 by 4 in. square, and weighs 30 lb.

The projector case houses a mute head, sound head, and amplifier, together with a driving motor and the interlinking mechanism and switches. The mute head is similar to the standard 16-mm. silent film projector, but is modified to run at the higher speed necessary for sound films. An adjustable gate mask and provision for speed regulation permit either sound or silent films to be projected with equal facility. The lighting and optical systems have been greatly improved, enabling a clearly defined and steady picture to be projected up to 6 ft. in width. Constant speed is maintained by a mechanical governor. The sound head is a miniature reproduction of that which is used in the standard 35-mm. equipments.

The switches for the projector lamp, exciter lamp, and amplifier, together with the motor rheostat and socket for loud-speaker lead, are mounted on a panel fixed inside the projector unit in a readily accessible position. In operation the projector unit is totally enclosed, except for a small opening in the front to permit the film to enter and leave, thus cutting off the slight noise of the projector mechanism. The volume control is brought out separately and can be adjusted without opening the projector case.

The three-stage amplifier uses indirectly heated " Mazda " valves and has an undistorted output of 3.5 to 4 W, the energy being supplied from the mains through the mains unit. The mains unit incorporates an auto-transformer and is so designed that the equipment can be run on any 50-cycle a.c. supply, by the correct location of a small screw plug in its appropriate socket, which is clearly marked with the supply voltage. The whole equipment is enclosed in a perforated sheet-metal case fitted with a carrying handle.

Rewinding is an easy matter. The spools are not removed from the projector; all that is necessary is to insert the end of the film on the take-up spool in a slot in the hub of the empty feed spool. Rewinding is then effected by turning a small handle which rotates the feed spindle through gearing. The setting up and operation of the equipment are also very simple.

The provisions of the Cinematograph Acts do not apply to the 16-mm. equipment, which can be used at any place and time, as desired.

The Assouan Dam Scheme

THE function of the Assouan Dam, at present, is to store the water of the River Nile during its flood to be used for irrigation purposes when the discharge is low. The flood occurs every year with remarkable regularity in August, September and October. It is of the first importance that the electrical construction work should not cause any interruption of irrigation schemes or in any way affect the building of the dam itself.

For hydro-electric generation, a head of 6 metres can be maintained in the dam during the flood period. Such a variation of head from 34.5 to 6 metres is greatly in excess of that usually admissible in practice for self-regulated turbines working in one stage and designed for a constant speed. The discharge of water through the dam varies from about 9,000 cu. metres per second at flood time to approximately 1,000 cu. metres at low Nile. This discharge variation, when taken together with head fluction, results in approximately constant power generation.

The maximum available output of the Assouan power scheme is about 330,000 kW, and the maximum water head at the dam, after the completion of the second heightening, in the early part of 1933, will be 34.5 metres. For the four turbine units, 16 sluices of the dam will be used, *i.e.*, four sluices per set. As the sluice is rectangular, three pipes will be used in each sluice uniting at the end to one. The specification of the scheme and conditions of tender will be ready by the end of the current year. The cost is estimated to amount to about £2,000,000 sterling.

Owing to the present financial crisis, power will be employed at the outset solely for the manufacture of synthetic fertilisers for manure from limestone.

The annual production will be 300,000 tons of calcium nitrate (now imported from South America) which contains 15.5 per cent. azote, requiring about 250 million kWh yearly. There will be four vertical turbine units, each delivering 35,000 kW.

The government is investigating the economic possibilities of the installation of a manure factory. It would cost about £2,000,000 (bringing the total cost of power station and factory to £4,000,000). The factory will consist of two parts: Section I at Assouan specially devoted to the production of nitric acid; and Section II in Cairo, near one of the big quarries where limestone is found.

From the economic point of view, this is the best solution, owing to the fact that there are no good quarries near Assouan, and also because the consuming centres are in the Nile Delta, and near Cairo.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Preventing Metal Corrosion

ONE of the biggest fields in metallurgical research is concerned with the prevention of the corrosion of metals, which represents a serious and constant drain on world resources. The subject was discussed at a joint meeting held recently between the Electro-platers' and Depositors' Technical Society and the Institute of Metals. The paper leading to the discussion was presented by Mr. H. Sutton, of the Royal Aircraft Establishment, Farnborough; it was entitled "Some Recent Advances in Protective Coatings on Metals." Many complicated factors have to be considered. There are many pitfalls for the unwary, and surprises for the most cautious!

An outstanding paper on cadmium and zinc plating was presented by Mr. S. Wernick. Both cadmium and zinc have attained importance as protective coatings on metals, and are employed effectively for the protection of iron and steel parts. Since the principle upon which the protection afforded mainly depends is that of "sacrificial protection," porosity of the deposits is probably of secondary importance, but experience has shown that the more porous forms of deposit which result, *e.g.*, from the use of too high current density in operating zinc and cadmium cyanide baths, fail to yield the high degree of protection obtainable by means of dense finely crystalline deposits.

This, indeed, is not surprising, since the "sacrifice" of the deposit will proceed at varying rates according to the nature of the surface, and in all cases the more porous deposit tends to retain moisture, residues of electrolyte from the plating bath and external corroding agents. It is further recognised that the potentials of metals are influenced by the condition of surface, and that the presence of films of insoluble or sparingly soluble substances upon the surface has a most striking effect upon the equilibrium potential.

In recent years there has been a great deal of controversy on the subject of testing the protection afforded by zinc and cadmium coatings.

Mr. Wernick showed the relationship between weight of cadmium deposit and rate of rusting of the underlying steel, and adduced experimental evidence of the greater protective efficiency of deposits of 0.0003 in. and upwards.

Protection of Light Metals by Electro-deposits

Zinc and cadmium electro-deposits on aluminium, as regards corrosion in marine atmospheres, and with the possible exception of cadmium electro-deposits on commercially pure aluminium, are capable of providing efficient protection for the underlying metal or alloy. Blasting with fine sand is an effective and practical means of preparing the surface for electro-deposition processes. There are, however, certain objections, *e.g.*, the production of a more or less open surface offering in itself low resistance to corrosion and the more or less dull and unattractive appearance of electro-deposits necessarily resulting from their application to unpolished surfaces.

The main features of the buffered zinc sulphate gum arabic bath developed at Farnborough (normal zinc sulphate 0.25, normal sodium acetate, 1 gm./litre gum arabic) are easy maintenance of good working properties as a result of its being well buffered and the presence of an additional agent giving deposits of consistently good texture. Subsequent experience has shown that the range of acidity for successful working of the bath is fairly wide. No serious difficulty has been experienced in depositing zinc on the usual wrought and cast aluminium alloys or on commercial aluminium from this bath.

Zinc cyanide solutions have presented greater difficulties on account of the interaction between the alkali of the electrolyte and the basic metal which was found to occur unless the free cyanide and free alkali contents were kept down to low values. The addition of ammonia to a zinc sodium cyanide bath proved to assist considerably in securing good working properties together with low cyanide content, and in avoiding blistering of the deposits.

It appears to be now definitely established that electro-deposits upon aluminium and aluminium-rich alloys can be produced by the use of suitable methods of preparing the surface and of suitable baths for the electro-deposition process, which are of practical value not only in protecting the underlying metal or alloy against corrosion, but also in rendering them much more attractive in appearance and general behaviour under conditions of use.

Considerable advances have been made recently in the use of immersion treatments of iron and steel, in which hot solutions of phosphoric acid and phosphates are employed to produce very adherent films of insoluble or sparingly soluble phosphates upon the surface of the metal.

Anodic Oxidation of Aluminium

Recent experience of the Bengough-Stuart process has indicated (i) the benefit obtained by the use of stainless steel cathodes with which the rate of deterioration of the chromic acid electrolyte is much slower than with carbon cathodes and the necessity for an efficient exhaust system owing to the increased amount of spray evolved. (ii) The necessity for securing complete removal of flux residues from welded parts before treatment in order to avoid local pitting during the treatment.

Some interesting data on the influence of anodic treatment on the corrosion-fatigue properties of anodically treated aluminium and duralumin have been published by McAdam, who found that anodic treatment is not effectual in maintaining the "air endurance limit" of aluminium or duralumin when the material is subjected to corrosive conditions. Anodic treatment followed by coating with lanolin raised the endurance limit to "air" values provided that the film was not damaged. General experience of the use of treated parts under marine conditions indicates that the film gives satisfactory service in many applications if supplemented by coatings of enamel or varnish, or by lanolin, preferably treated for prevention of development of acidity.

According to Setoh and Miyata the addition of sodium silicate to a slightly different bath (chromic acid 3 per cent., oxalic acid 2 per cent.) increases the anode potential, but decreases the scratch-hardness of, and the protection afforded by, the film. The same authors have published some interesting results of experiments made with a.c. alone and superposed on d.c., and an electrolyte consisting of a 2 per cent. solution of oxalic acid.

Radio Receiver Design

AT the informal meeting of the Institution of Electrical Engineers on April 11th, Mr. C. F. Phillips opened a discussion on "The Modern Trend of Design of Broadcast Receivers."

He said there was no doubt that the most definite trend was in the direction of reduced cost to the public, coupled with simplicity of control, but considered from a technical point of view these two factors were absolutely opposed to one another. Simplicity of control really meant one-knob tuning, which could not be achieved in the usual type of set without more tuned circuits and radio-frequency stages with their associated valves, condensers, inductances, and other components, together with elaborate shielding and more, much more, time spent in the factory on the testing and adjusting of each set.

The motor car manufacturer would say that it could be done provided a bigger output could be attained, but if all manufacturers worked in the direction of bigger outputs supply would be greater than the demand. It would therefore seem that the price to be paid for simplicity of control, coupled with low price, was a reduction of the number of manufacturers and the concentration of design and production in fewer hands. Meanwhile, it would appear that the consideration of price was limiting design to a serious extent.

The Loud-speaker Question

He wished he could say that he really believed designers were being encouraged in the direction of better quality. Some four years ago there was a real demand for an improvement in the quality of reception, and that demand was being met, but as mains operation became more general high output levels were demanded and unfortunately high output and good quality seemed to be incompatible with low cost. As to loud speakers, there appeared to be a definite trend towards the coil-driven cone, which could be extraordinarily good. Usually it was not so good, not even so good as the designer could make it, because he was told it must be bad enough to sound pretty good on *any* set; in other words, it must conceal the defects of bad sets, which were still in the majority.

Electroculture in the United States: the heaters are plugged in and rest upon supporting boards beneath the beds

Another very definite trend in design seemed to be in the direction of self-contained receiving sets, often combined with a gramophone turntable. Some years ago very few sets contained either an integral loud-speaker or their own source of power. In America it was quickly realised that the potential purchaser of a receiving set thought in terms of a piece of furniture somewhat akin to a gramophone, and, therefore, the cabinet became larger in order that it might accommodate loud-speaker, eliminator, and accumulator, and often some means of charging the latter.

From that point it was only a short step to the all-electric set, which was really made possible by the introduction of valves with indirectly heated cathodes. As the all-electric set comprised loud-speaker, amplifier, and power supply, the inclusion of an electric gramophone turntable and a sound box was obviously the next step, and so the radio-gramophone came into being.

Compliance with Regulations

Finally he thought that it should be considered whether there was any real tendency on the part of the designer of broadcast receivers to comply with the I.E.E. Regulations for mains-operated sets. He had the impression that the Regulations were not being taken seriously, except perhaps by some of the larger manufacturers, and that the greater number either did not bother about them, or refrained from so doing on account of the small additional cost involved. It was a cause for satisfaction to know that mains-operated sets were not usually installed in damp situations, such as bathrooms, for if they were there was no doubt that accidents would occur.

Standardisation

Mr. F. A. Cobb said he thought that the solution of a good many difficulties was in standardisation, and that manufacturers should not make all their components as so many did to-day, while there should be a standard range of some twelve to twenty valves.

Mr. Phillips agreed that the standardisation of components might come, but it was a good thing that valves required such special and expensive machinery, otherwise no doubt radio manufacturers would be making them too. He thought that the B.B.C., now that it had its fine new building, might consider setting aside some of its space for a demonstration room where the public might learn what proper reception really was and presumably obtain advice. This was in reply to Mr. P. K. Turner, who remarked that he failed to see any recognition that the cheaper sets were not perfect. Radio makers proclaimed every set as perfect, and even among users ignorance of good reception was remarkable. The call was for loud-speakers—and they must be moving coil—at prices and in a compass that utterly prohibited good quality.

Protective Control of the Grid

THE final meeting of the 1931-32 session of the London Section of the ELECTRICAL POWER ENGINEERS' ASSOCIATION was held on April 12th, when a paper entitled "The Protection and Centrovisory Control of the British Grid" was read by Mr. B. H. Leeson. The paper covered some of the ground dealt with in Mr. H. W. Clothier's paper before the Institution of Electrical Engineers a few weeks ago.

The superimposed interlock protective system utilises one of the 132-kV lines as a pilot, and in this way provides complete unit protection without the time delays inherently associated with time-distance protection. The principle of construction underlying centrovisory control, as developed by Messrs. A. Reyrolle & Co., Ltd., is the elimination of multitudinous relays and small wiring in favour of robust mechanism, the equipment operating over radial Post Office pairs or voice-frequency channels of communication. Because of its economy, such equipment is now being used for the remote control of individual grid stations from the nearest power station, but its chief application is for the control of a large number of grid stations in a regional area from one centrovisory control room.

A feature is the special manual and automatic system diagrams which are superimposed upon each other and arranged in a circular form for space economy. They allow switching operations to be premeditated by hand operation and directly compared with the actual switch positions existing as recorded by the automatic diagram. Thus the two can be rehearsed and brought into line with each other as desired. The transmission of stereotyped messages and continuously checked meter readings are simply performed by the use of "Tallygraphs" and "Tallymeters," whose operation, so far as means of communication is concerned, depends merely upon the despatch and receipt of an appropriate starting and stopping signal.

The South-East England Scheme centrovisory control room was described as typical; it incorporates a calculator for determining the values of short-circuit currents in the regional area. It will regulate the performance of about 50 stations, about 2,000,000 kVA of plant, about 3,000,000,000 kWh consumption in about 9,000 sq. miles with a population of 12,000,000 and fifty-six 132-kV lines with a total mileage of about 550.

Discussion

Mr. W. G. Sutton expressed the view that we had a long way to go yet on the automatic control of the steam side to meet demands at short notice; even pulverised-fuel installations could not be turned on at will. Under the centrovisory system a vast amount of power would be vested in the control engineer.

Mr. Ellis, referring to the interlock system, said that, in the case of a village supply which was teed off the line, if the line broke the supply would be cut off. In the split pilot system a considerable amount of induction took place in the pilot wires, and trouble had already been experienced due to this when the relays were set very lightly.

Mr. A. G. Drew said that if efficiency was to be maintained each base-load station would have to operate at unity load factor, and it should not be possible for the load on any particular station to be constantly changed at the will or caprice of the control engineer.

Mr. W. A. Gilbert said the new types of protective gear suggested that the older types would have to be shelved. He wondered how long it would be before the new types would be regarded as no good.

Mr. Scott said he knew of some protective gear which had been in service for twenty years and was still working satisfactorily.

Mr. H. J. Henwood said that in the London area grid transformers were put straight on the line without any isolating switches. He could foresee circumstances under which faults might occur due very largely to trouble in an adjacent area.

Use of Post Office Wires

Mr. A. H. Bennett, chairman, did not feel at all comfortable about the use of Post Office wires. He hoped that when the Central Electricity Board was fully at work it would not have telephone and telegraph lines mixed up with the power lines.

Mr. W. J. Oswald said it seemed that a protective system was almost required to look after the first protective system. What would happen to the control engineer when a pilot cable was damaged? From that point of view the more control was centralised the more the whole scheme of things might be upset.

Mr. Leeson, in the course of his reply, explained that he did not intend to imply that existing protective systems were not satisfactory, but that certain systems were not suitable for application to the new conditions which had to be met. Failure of one of the Post Office communication channels might mean that the other one used to replace it temporarily might not go direct from point to point; indeed, it might go forty miles round to link up two points only a few miles apart. Consequently, if the sensitivity of the relay was only suitable for ten miles, trouble would ensue.

Mr. J. R. Cowie suggested that the interlock system using high frequency and no pilot was capable of application not only to overhead lines but also to underground cables. The fault settings were to some extent governed by the size of the system feeding in. There were circumstances in which there would not be enough current on the line to make the protective gear work.

Mr. Leeson replied that in such cases as Mr. Cowie had mentioned the right thing to do with distance protection was to measure the reactance. He believed there was a great future for superimposed working. It was quite likely that when the grid obtained its full load they would have stereotyped methods of working which had been predetermined. The fault setting would be a certain figure during the first few years when the load was growing and then later, as the load developed, the setting would be increased.

How Electricity Supply Costs are Analysed

THE paper on the above subject by Major E. H. E. Woodward and Mr. W. A. Carne (which was referred to last week) was read and discussed at the INSTITUTION OF ELECTRICAL ENGINEERS on April 14th.

Mr. R. P. Sloan thought the paper would serve as a "book of reference" to the all-important subject of "electrical costing." They were not merely selling a commodity, but service also (a modicum of the latter was necessary in every case) so it was essential to know the cost of production of both items.

In the case of industrial supplies, particularly, it was necessary to ascertain the cost within a fraction of a penny. A temporary surplus of plant did not justify the ignoring of capital charges.

Mr. F. W. Purse said he was unable to see how the authors had arrived at their conclusions. Their statements were contradictory; they would have done better to assume a hypothetical grid tariff and indicate its applications instead of examining generation costs.

The whole paper was an arbitrary analysis based on average figures, so that the method would not produce better results than those obtainable by simple and more usual methods. The paper showed what the industry had always suffered from, namely, "tariff disease;" their job was to make electricity, not tariffs.

Prices and Service

Mr. H. H. Hobson differed from the last speaker. He thought that the paper would be of definite use; only one previous attempt had been made (in America) to undertake a

similar analysis, and even that was not so complete as the present one.

He agreed heartily that "the fact that it is seldom, if ever, satisfactory or practicable to sell upon a pure cost basis, as the proper price of any commodity is governed more by its value to the customer (which must be realised to be true even under a national scheme) is no reason for neglecting a careful consideration of cost, so that the necessary departures therefrom may be made with knowledge and intention and not in a haphazard manner."

They were selling service in competition with the cost of providing that service in another way. Some people tended to base their prices on alternative costs, irrespective of whether they had any real relation to their own cost of production or not. The authors rightly emphasised the necessity for great caution in the application of the diversity factor.

Mr. H. M. Sayers considered that the paper would serve as a model for some time to come, although he did not necessarily agree with all details of the method. The costs of distribution losses were cumulative and differed from those of generation. Useful information would be obtained if the method applied by the authors to consumers were applied also to distribution.

Municipal rating was of the nature of income tax, but he was not prepared to state just how it should be allocated. The analysis of domestic demands and consumptions was perhaps the most novel part of the paper, and that was the sort of information which was really wanted.

The fixed charge was not liked; what did the consumer get for it? It was essential to avoid it, and the best way of doing so was by the use of classified flat rates, which would take diversity, &c., into account. The authors had shown how that could be done. There was no means of ascertaining the value of service, particularly to small consumers.

Power Factor Discounts

Mr. W. Pollard Digby found some inconsistency in the paper. The fact that one class of consumer was not so wealthy and had not the same means of "Press stunting" as another was of importance in some areas. When a consumer's power factor was better than that of the station load surely the consumer was worthy of a special discount. It would be difficult to persuade customers to accept a three-part tariff.

Mr. W. J. Jones complained that, while there was a wealth of information about the cost of generation, there was a dearth of distribution data. The manner in which loads grew exercised material influence, and care was therefore very necessary when costing on an average basis.

Mr. H. C. Cooper remarked that costing was now a normal procedure in most industries, and it was quite time the subject was tackled by electricity suppliers too.

Mr. D. J. Bolton discussed the allocation of capital charges. The authors' method made comparison difficult; one should be able to see at a glance whether an item would be profitable or not. Capital costs of land and plant were lumped together without indication of relative kVA and kW division, which must be known if a power-factor tariff was to be used.

Cost analysis often gave a high fixed charge and too low a running charge; for instance, a 5 per cent. p.f. consumer did not "lock up" ten times as much plant as a 50 per cent. p.f. consumer did.

Mr. J. W. Rissik regarded the paper as a formula by means of which tariffs could be framed for new consumers. The authors had carefully estimated most of the variable factors, but it was not clear how the diversity factor was arrived at.

Mr. J. N. R. Perks desired to know more about estimating for the future rather than how certain factors should be subdivided. One of his colleagues had discovered a law which the overhead charges of a company undertaking followed, indicating the relation between overhead expenses and the number of consumers.

Distance must surely enter into estimates of cost of supply. If the paper did nothing more than restrain some people from selling electricity at any cost it would not have been written in vain.

G.E.C. four-pan fryers at Messrs. Woolworth's new premises **(see page 607)**

Mr. J. I. Barnard complained that the selling organisation, upon which so much depended, had not been given sufficient prominence. He protested against the cost of advertising being sandwiched between two such miscellaneous expenses as stamps and telegrams—it was more important than that.

The Authors' Reply

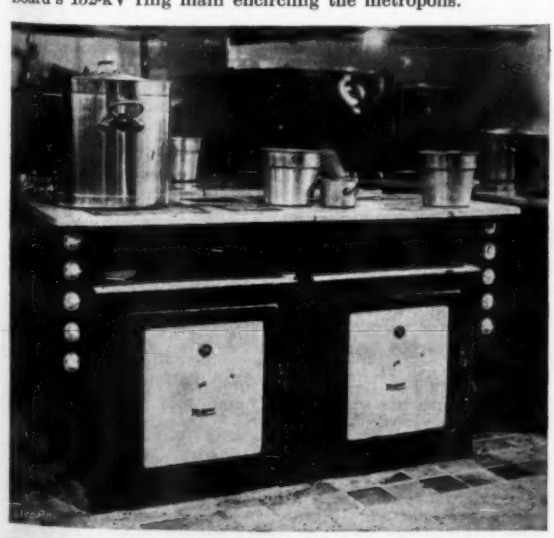
Major E. H. E. Woodward, in reply, explained that the analysis was not intended to serve as a tariff, but to provide data which could be incorporated in tariffs. When calculating with one year's figures, adjustment must be made, of course, for changing conditions with time. When dealing with an interconnected area as a whole it was difficult to determine what distance really was.

Mr. W. A. Carne, who also replied, described how the calculated figures had been checked by a system of balancing. There was no diversity in sign illumination and public lighting, so that little cost accounting entered into them.

Linking Up London's Power Stations

THE manner in which London's electricity generating stations are being interconnected is the subject of the paper which Mr. J. D. Peattie read before the Association of Supervising Electrical Engineers on April 19th.

The area dealt with is that part of the South-East England Electricity Scheme which lies within the Central Electricity Board's 132-kV ring main encircling the metropolis.



One of the six cookers in Messrs. Woolworth's all-electric kitchen **(see page 607)**

Leaving out of account the railway and tramway independent requirements, this area absorbed about 2,517 million kWh in the year 1929-30, an increase of 15 per cent. on the previous year, which itself showed an increase of about 15 per cent. on its predecessor. There is every evidence that the rate of increase will continue for some considerable time to come.

This load was supplied from fifty-eight generating stations, twenty-seven of which, each under 10,000 kW of installed capacity, only generated about 4 per cent. of the total. The average cost of the energy supplied from these stations, including an allowance for capital costs, was 1.508d. per kWh. Five groups of large stations generated about 66 per cent. of the total at an average price, including allowance for capital costs, of 0.466d. per kWh.

During the year ended March 31st, 1930, the forty-five local authorities in the London and Home Counties Joint Electricity Authority's district generated about 897 million kWh and purchased from outside the group another 169 million kWh. Inter sales within the group amounted to 113 million kWh. In the year ended December 31st, 1929, the forty-eight company undertakings generated 1,620 million kWh and purchased some 19 million kWh. Inter sales amounted to 1,019 millions.

The fact that the ratio of total kWh purchased (plus inter-sales) to the total kWh generated amounted to 32 per cent. for the local authorities and 64 per cent. for the companies is a rough guide to the measure of co-ordination within the two groups. These figures do not include the railway and tramway stations, which generated 924 million kWh as compared with the 2,517 million kWh for the public supply stations.

Ring Mains

The scheme now being carried out by the Central Board comprises a 132-kV ring system round London with a cross-connected 66-kV cable system over the area. North of the Thames a single-circuit 132-kV line runs from Uxbridge *via* Willesden to Watford, continuing as a double-circuit line through Brimsdown to Barking.

South of the Thames the lines connect Woking, Wimbledon, Croydon, and Northfleet. Barking is connected to Northfleet *via* the high Thames crossing now under construction, while on the west side of London the ring is completed by the line joining Uxbridge and Woking.

On the north bank of the Thames a heavy group of 66-kV cables runs west from Barking to East Ham, continuing through West Ham, Poplar, and Stepney to Shoreditch, where they divide, one section running north to Hackney and Walthamstow and the other west to Islington, where they meet another group of cables extending from St. Marylebone to St. Pancras and Islington to Hornsey. Finchley is connected to the latter system by a group of 6.6-kV cables.

On the south bank of the river a connection is being made from Battersea (London Power Co.) by 132-kV cables to the overhead lines at Wimbledon. A similar connection runs from the Deptford (West) station of the London Power Co. by 132-kV cables to Eltham, and thence by a 132-kV overhead line to Northfleet; 33-kV spurs from the latter section at Eltham and Northfleet connect up Woolwich and Gravesend respectively. From the London Power Co.'s Battersea station another group of 66-kV cables runs west through the Battersea Borough Council's station and Fulham to Hammersmith with a 6.6-kV further extension from the latter station to Barnes. Kingston is connected to Wimbledon by two 33-kV cables.

The London interconnections will be completed by the 66-kV cable system of the London Power Co., which connects together its generating stations at Battersea, Grove Road, Willesden and Deptford. The cable between Battersea and Deptford will be looped into the Bankside station of the City of London Co. The main 132-kV ring is interconnected with the remainder of the South-East England Scheme. From Watford, the lines run north to Peterborough, thence east to Yarmouth, returning ultimately to Barking. Inter-area lines connect this system with the Central England and Mid-East England Schemes at Bedford and Peterborough respectively.

The recently opened League of Nations wireless station

The Kent ring forms a complete loop, serving the south coast towns and is connected to the London ring at Northfleet. From Uxbridge the lines run west to Reading to connect up with one of the rings of the South-West England Scheme. Secondary 33-kV systems have been constructed, based on the parent points at Croydon and Woking.

Oil- and Gas-filled Cables

As an experiment the Board decided on the construction of three lengths of 132-kV cable between Deptford (West) and Eltham; Battersea (London Power Co.) and Wimbledon; and a lead-in at Croydon on the Croydon-Northfleet line. The Deptford (West) Eltham section is now in the preliminary testing stage. These cables are of the single-core, oil-filled type with a hollow conductor, oil impregnated paper insulation and two lead sheaths with intermediate brass reinforcement.

The cost of such cables is high, and considerable difficulty may arise in obtaining the necessary sites for the feed and pressure tanks at comparatively frequent intervals. Moreover, from an æsthetic point of view it may be a case of "out of the frying pan into the fire."

Three types of single-core 66-kV cable are being laid in the London area, *viz.*, the solid, oil-filled, and pressure types. The first is of normal construction, the second is of the same type as the 132-kV cable which has just been described, and the third type has been developed more recently. The cable itself is of the solid type with a lead sheath somewhat thinner than usual. In order to prevent the formation of voids during the temperature cycles, the cable is laid in a welded steel tube, filled with nitrogen at a pressure of 15 atmospheres. A length of this cable is to be laid as one of the links between Hackney and Walthamstow.

Metering and Protective Arrangements

Extended use is being made of pilot systems of protection. The split pilot has been adopted throughout for the cables and short sections of overhead line. For the longer lengths of overhead line, where pilots would be unduly costly, such as those between Uxbridge and Woking, Woking and Wimbledon, and Croydon and Northfleet, distance protection of the reactance, ratio-balance, type has been chosen. Transformers are protected by inverse time overload and restricted earth leakage relays.

Special metering arrangements had to be devised. The two-part allocation of charges according to kW demand and kWh made it necessary to measure accurately combined maximum demands over half-hourly periods. The introduction of power factor correction also called for accurate measurement of this quantity, which has been met by metering the associated reactive component of the energy flow.

At generating grid points where the simultaneous maximum demand of numerous circuits has to be measured accurately, the impulse method of summation has been used. The main integrating meters which measure the kWh are provided with contact-making devices; these transmit impulses to the summators, where they are added mechanically by differential gearing. This, in its turn, operates a summation dial and printometer mechanism which are reset every half-hour in the usual manner, so as to give the average demand over that period.

Control

For the control of the South-East and East England Schemes, the Board is erecting a control centre near Bankside generating station. At the present moment a temporary control room is in operation on an adjacent site, using simple telephone communication. Channels hired from the Post Office will radiate from this centre to all transforming and switching stations on the 132- and 66-kV systems.

In addition to being used for telephone conversations, the channels will also transmit automatically from each primary station certain vital information to a central indicating board in the control room. Provision is being made for indicating there

(a) The open or closed position of every 132- and 66-kV oil switch.

(b) The position of every 132- and 66-kV transformer tap-changing equipment.

(c) The meter readings on demand of the total import or export to or from a transforming station.

(d) The line voltage readings at certain selected points.

(e) The total load indications from the more important generating stations.

Visual instruction telegraphs are also provided for transmitting certain definite orders from the control room at Bankside to the more important generating stations. For the stations on the 33-kV secondary power systems, telephone communication only is arranged, the connection to the control room at Bankside being established through their parent grid point.

The control engineers will also have before them a hand-set miniature diagram of the whole system showing the in and out positions of all isolators, earthing switches, and oil switches. A large wall diagram, electrically operated from the miniature diagram, will also be available.

The E.T.B.I.

THE annual general meeting of the Electrical Trades Benevolent Institution was held in London on April 19th. The report of the Council showed that for the year ended December 31st, 1931, the income was £3,399, which was increased by receipts from dividends to a total of £5,539. Considering the abnormal state of the year, the annual festival which took place in February last under the presidency of Mr. Allen West met with gratifying success.

Each succeeding year demonstrates more and more strongly the necessity of this Institution; during the year under review the number of grants made was nearly 280, in addition to which nine pensions have been granted, making the total expenditure on relief for the year a sum of £2,775, which represents an increase of nearly 200 per cent. in the short space of five years.

The Propaganda Department is now in its second year and was very active during 1931, about 100,000 circulars and pamphlets having been despatched in that period. Although results were not up to expectation, there is no doubt that this Department is very considerably widening the activities of the Institution by making it better known to members of the industry.

It is hoped that the invested funds of the Institution will continue to increase so that the Council may be able to extend its pension activities. During the year most of the branch centres have been particularly active, and the Council expresses its appreciation of the work they have put in during the period under review, especially that of the members of the committees and honorary secretaries of the two newly formed branches at Birmingham and Middlesbrough. The Council states that legal difficulties prevent the incorporation of the Institution.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Hybrid Cookers

Messrs. William Geipel & Co. and Mr. H. B. Leighton appear to think that I claim to have originated the idea of combining gas rings with electric ovens. This, however, was not my intention, which was merely to advocate such a scheme. The fact that it does not happen to be new does not in any way detract from the importance that I continue to attach to the subject.

Mr. Leighton's letter, showing and describing a six-oven range, is at once interesting and instructive, especially when he remarks that "Gas was decided upon for the top cooker because of well-known drawbacks." This surely goes to prove the accuracy of my contention as to the superiority of gas rings for boiling, and the reasonableness of my suggestions; particularly when he goes on to state "the cooks were quite satisfied with the arrangement."

Having launched such an ambitious scheme as this as far back as the year 1918, I feel tempted to ask Mr. Leighton what was the result of this experiment, and what progress has been made since that time with other ranges of a like nature or with the ordinary single oven domestic cooker. If little or no progress has been made this is not due to any defects in the system, but probably to the apathy of the gas and electrical interests.

Messrs. William Geipel & Co. state that their boiling ring is not new, as I had imagined, but has been on the market for some six years. I can only express surprise that it has not long ago superseded all others if their claim that it was as efficient as a gas ring, and preferred by cooks for simmering, has been duly substantiated. As its heat is regulated by distinct fixed stages (three at the most, possibly) by the operation of a snap switch, I cannot imagine how it can possibly compete as an efficient simmering medium with a gas ring minutely regulated by a simple tap.

It is possible, of course, to blow out a gas flame, but I do not feel inclined to alter my opinion of the gas ring's superiority for boiling on that account.

London, W.1, *April 16th*, 1932. F. RISCH.

Neutral Fusing

"Delta," in his letter in the current issue of the ELECTRICAL REVIEW, raises a very interesting point which he is not alone in finding difficult to understand. In two-phase four-wire power installations of small size, it is customary to use distribution boards with two banks of fuses and two neutral bars and it is difficult to see how a power circuit differs greatly from, say, a domestic heating circuit, in which double-pole fuses would be used.

The matter is of greater interest because it seems probable that in the near future miniature circuit breakers will supersede fuses in domestic work to some extent and the system would be greatly cheapened by the use of single-pole circuit breakers. For lighting circuits in house work, the circuit breakers are probably best mounted as a distribution board, but for heating circuits another point arises and this is whether a ring main system of distribution to the plug points would not in some cases be a cheaper method than running final sub-circuits to each point from a double pole distribution board.

Not only would it perhaps be cheaper to do this, but the installation would be more simple if, say, a ring main of 7/.044 ran round the building at each floor level and was tapped as it passed the plug points, the main being protected by a circuit breaker of perhaps 50/60-A capacity and 15-A single-pole circuit breakers combined with the plug sockets provided at each point required. The main could carry 6/8 plug points as they would not be likely to be all fully loaded at the same time.

In this case the I.E.E. Regulation 94 E (a) would not appear to be complied with as both wires are insulated from earth, according to my interpretation of Definition 14, but 94 G (d) would appear to permit such a system, provided the neutral is solidly earthed.

April 15th, 1932. STAR.

An Unreliable Profession

I am a little disappointed that my letter in your issue of April 1st did not call forth a spirited defence from some of those more fortunate men who, by circumstance, influence, or lucky association, remain in thought-occupying or thought-preventing occupation even if trembling for their security. Some such defence might have brought just a ray of pride to those apparently destroyed by economic, political, or even less worthy considerations.

I wonder how many electrical engineers on whom the door they knew so well has been slammed have checked up on their position and experience in the search that appears futile. The ELECTRICAL REVIEW is almost the only link many now have with their life's work, but its advertisement columns this week contain sixteen indifferent jobs and eighty-five seekers with some hope and enough money to advertise their want. If any receive replies I venture to say they will be offers to achieve the next to impossible at their own expense. The ratio of seekers to jobs of any sort at all is of course much greater than that comparison suggests and, even if reluctantly, the search must be extended to a wider field.

There is only one avenue open to-day to those not gifted with inspiration or artistic ability. That is to help industry in the difficult work of selling its products. To tackle that job means often to fight oneself; to overcome dignity and hesitation; to summon up courage and cast out fear; to make the will overcome or direct the wish.

The industry is hopelessly overcrowded and becoming more so by the exploitation of the ignorant or foolish. It appears to be suffering from monopolistic schemes that weaken its enterprise, destroy its human material and are more selfish than moral. The self-interest of which many appear to be the victims is perhaps one clue to the salvation of those who can serve their own end by serving others. The individual must endeavour to fight this challenge to himself patiently, steadily, and pluckily, and a few lessons which I have taken without fees or material profit have at least had the merit of being interesting and hopeful. I think the "Man" must come "out" of the Engineer.

Amersham, Bucks, *April 17th*, 1932. A. H. PALMER.

High-voltage Sub-station Insulators

After reading the article bearing the above title, and Mr. Halton's reply to Mr. Andersen, we can only assume that there is a regrettable lack of knowledge of porcelain insulator design, even among people intimately connected with their manufacture.

In dealing with the inherent stresses which are liable to occur in porcelain, Mr. Halton has completely overlooked the fact that such stresses may be due, not only to incorrect firing, but also to improper methods adopted both in the actual formation of the insulator shape and during the drying process prior to firing. In his treatment of stresses due to possible growth of cement with age, Mr. Halton is far less dogmatic than the writer of the original article.

A vast amount of research has been carried out on Portland cement for use in conjunction with porcelain insulators, and we can definitely confirm Mr. Andersen's statement that cements are obtainable in England which are ideal for this purpose, since they do not expand with age when used in a correct manner. As a matter of interest, neat Portland cement of special quality can be obtained which actually contracts with age, owing to the gradual drying out which occurs.

Members of the E.A.W. on a visit to the Fraser & Chalmers Works of the G.E.C. at Erith

Regarding the vexed question of stresses set up by differential thermal expansion of the component parts of an insulator, if Mr. Halton is confining his remarks to the multi-part pedestal insulator, a drawing of which appears in your original article, we must agree that there has been a complete disregard of scientific principles in its design.

Allowance is made in modern insulators to enable differential expansion to take place without stresses being set up; the mere provision of a so-called resilient medium between cement and porcelain is of little value. Such materials are, in point of fact, almost incompressible; their value simply lies in the fact that they are fluid to a certain extent. This is obviously of no value unless space is provided into which the fluid will flow when differential expansion takes place.

By far the best way of providing the necessary compensation is by the use of treated sanded surfaces. Such surfaces consist essentially of thousands of specially shaped porcelain granules integral with the porcelain itself, the whole coated with a suitable medium which flows away from the tips of the granules during the drying process, thus leaving the tips exposed. In the cemented insulator, it is found that such surfaces, while maintaining a positive lock with the cement, at the same time allow differential movement in all directions, sufficiently large to prevent thermal stresses, even when the insulator is unequally heated.

Incidentally, these specially treated surfaces enable the mechanical stresses due to external loading to be more equally distributed over a surface than is possible by any other means.

We do not wish this letter to be construed as a criticism of pinless post insulators in general, but the full advantages of such insulators can, in our opinion, only be obtained when due attention is paid to the method and the materials used in affixing the metal-work to the porcelain.

TAYLOR, TUNNICLIFF & CO., LTD.,
Eastwood, Hanley, *April 12th*, 1932. E. D. Spencer.

Breakdowns of multi-part pin insulators, definitely attributable to cement troubles, have occurred too recently to be dismissed as a myth, and it is most interesting to learn that cement "has long ceased to worry reputable insulator manufacturers." The latter, if Mr. Andersen's statement is correct, must be endowed with skins as impervious as the cement which he talks about.

A great deal has no doubt been accomplished in the direction of a reliable cement—more time seems to have been devoted to cement than to the development of the design of insulators—and thus we have the porcelain-cum-cement, or to coin a new word, "porcement," insulator, which now seems to have reached perfection in the minds of certain insulator manufacturers. Mr. Andersen agrees that once upon a time cement was responsible for a certain proportion of breakdowns, but now implies that cement definitely prolongs the life of an insulator!

He declares his complete agreement with Mr. Halton's remarks that in modern porcelain manufacture thermal stresses no longer play a destructive rôle. Therefore considering the theory of probabilities to which he refers, though not desirous of posing as a philosopher, I should think that of two similar insulators the one incorporating cement is more likely to break down than one without.

Turning to the question of the cylindrical post type insulator consisting of built up units as used on 132-kV grid switchgear, another correspondent makes the astounding assertion that this type is not as mechanically strong as the cemented multi-part pedestal type. On the contrary, the vastly superior mechanical characteristics of the cylindrical type under torsion and bending have been accepted by leading switchgear manufacturers in this country and on the Continent as providing opportunities for more economical and reliable design of outdoor switchgear with a highly desirable factor of safety.

Reports from the Continent indicate a tendency towards still higher transmission voltages than 220 kV. This necessitates pedestals of considerably greater height, with proportionally higher torsional forces. It appears that only the cylindrical design of pedestal can offer the tremendously high factor of safety that this would entail.

The cylindrical type post insulator is thus an important step in the evolution of insulator design. It appears to me to be as futile to talk of records of service as it is to question the design of the new Sydney Harbour bridge because the latter has no records of service.

Rusholme, Manchester, *April 15th*, 1932. M. W. SINGER.

Mr. R. C. Andersen points out an error in his letter which appeared in our last issue (p. 565). One paragraph begins: "Having eliminated Group II stresses . . . ." when the reference was actually to Group I.—EDS., ELEC. REV.

To What is Unemployment Due?

I submit that the problem of unemployment has assumed proportions which are a menace to industry in general and is too serious to be regarded as just the misfortune of those unemployed. Sentiment and pity are out of place in business and will not effect a cure, but the study of individual cases of hardship can indicate basic reasons and possible remedies.

I have had twenty years' practical, administrative and organising experience in one branch of the trade and, since the war, have worked for four large manufacturing concerns. Each of these firms found it necessary to carry out drastic factory reorganisation to secure greater efficiency and *not* because of any shortage of orders. The story is soon told. No. 1 reorganised at least twice and then went out of business. No. 2 was successfully reorganised by foreigners. No. 3 was reorganised not so successfully by foreigners and the process continued spasmodically for some years until recently, when I read that "reorganisation is now in progress." No. 3 firm sent me to reorganise No. 4 (my first commission), but whereas the organisers in the other cases had autocratic powers, I was given an ordinary departmental executive position without extra authority and left to my own devices.

Within one year everything was cleared up, orders ran to time, output increased, stocks were at maximum, and important customers returned or gained fresh confidence in us. It was then conveyed to me that as things were now going smoothly my job receded in consequence and unless I was willing to recede with it—well, there were others.

Thus, I contend, in view of my experience, that the "world wide trade depression" is only an excuse for, or the result of, bad management. Many firms are doing well and many are not. Times are difficult and depression now exists, without a doubt, but man was created to overcome difficulties, not to make them, and if we do not go forward it is because the right men are not in the right place.

It is generally admitted that mass production methods have stopped the supply of men of the type formerly obtained under the old apprenticeship and general training system, who built up industry to its present state, and so, in that respect, we are not only living on our capital but are reducing that capital with greater rapidity by automatically barring experienced men because they are unemployed. Also, it is undoubtedly true that many self-reliant men are not in work because they cannot agree to be time-servers, inefficient or even dishonest, and this is the type we allowed to go abroad in the past to build up American industries to our own detriment.

To crown all, firms exist who undertake the reorganisation of other firms to any extent and to do this they need highly trained men. These men, in many cases, are obtained from among those already employed and presumably engaged upon important work, to the possible detriment of the firms losing their services.

No one knows the numbers or circumstances of the salaried class of unemployed and there is an entire lack of co-operative effort to deal with the matter. My suggestion is that a trade organisation, preferably the employers, should compile a list of these men, and if possible have an examining committee to establish degrees of qualification. Any firm requiring men would then be able to obtain a verified selection of competent people at less trouble and expense than at present, and a small fee paid by the employers should make it self-supporting.

April 16th, 1932. FRANK.

Radio Telephony in Brazil

We note in the issue of March 11th, 1932, of the ELECTRICAL REVIEW an announcement concerning the inauguration in Brazil of a public radio-telephone service by means of a recently erected short-wave station. It would appear from this information that the inauguration of this station in December, 1931, enabled Brazil to communicate by radio-telephony with the United States of America and Europe for the first time.

As a matter of fact regular public radio-telephone services from Brazil to Europe were established by the Companhia Radiotelegraphica Brasileira as early as March, 1930. The first radio-telephone circuit was inaugurated on March 17th, 1930, between the short-wave stations of the above-mentioned Brazilian company and those of the "Transradio A.G." in Berlin. The German end of this circuit is now operated by the Reichspostministerium.

Further direct radio-telephone circuits were opened in March and April, 1930, by the Brazilian company successively between Rio de Janeiro and Madrid, between Rio and Paris, between Rio and Buenos Aires, and between Rio and England, the English end of the circuit being operated by the General Post Office.

It is clear, therefore, that the new short-wave station can in no way claim priority in the establishment of public radio-telephone communications between Brazil and Europe.

R. BOUGUIÉ, *Managing Director*,
Companhia Radiotelegraphica Brasileira.
Rio de Janeiro, *March 27th*, 1932.

A Village Supply Scheme

I have read with interest in your issue of April 15th the description of the pumping plant for the village of Ashmansworth. I would like to point out, however, that the tariff for electricity in force in this area is our standard two-part tariff which, in the case of residences, is based on the floor area. The fixed charge starts with a minimum of £3 per annum for a house of 700 sq. ft. floor area, and advances by 10s. per annum for each 100 sq. ft. up to 1,600 and then by 7s. per annum. Included in the fixed charge is a block of energy at the rate of 40 kWh to the £1. All electricity in excess of the fixed allowance is charged for at 1½d. per kWh and not 9½d. as stated in your article.

The alternative flat rate is, for lighting, 9½d. per kWh, and for power 3d. per kWh for the first 3,000 kWh per quarter and 2d. for all in excess of that quantity. Three lighting points and one power point are installed free for each consumer who takes his supply on the "two-part tariff." There is no limit to the size of property to which this tariff is applicable.

W. E. BRANDRETH, *General Manager*,
Wessex Electricity Company.
London, S.W.1, *April 18th*, 1932.

Trams *versus* Buses

I should like to express my agreement with practically the whole of the contentions of your correspondent, Mr. J. H. Campdale, in your issue of April 8th. Owing, apparently, to lack of clearness on my part, however, he has mistaken my original remarks regarding the development of the electric trolley bus to imply that I meant that the trolley bus itself had not been developed, whereas, actually, I intended to show that the use of the electric trolley bus had hitherto been on only a small scale.

Your correspondent expresses this point very clearly in the last paragraph of his letter, and I can only hope that this correspondence may have done some little bit towards awakening electrical engineers and those responsible for transport services to the possibilities of electric traction as distinct from the petrol- or oil-driven motor omnibus.

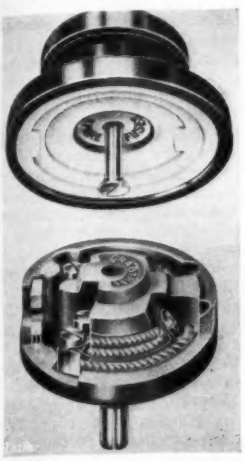
New Moston, Manchester, *April 13th*, 1932. J. BAGGS.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Double-pole Fused Plug

A new 2-5-A plug, made by Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall, embodies a fuse on both poles contained within the plug itself, so that it can be used with clocks, radio sets, and other portable apparatus, enabling their fuses to be carried with them. No special fuses are required, as standard wire is used, thus enabling the user to choose any fusing value, while enough spare wire for six refills can be housed in the cap of the plug.



"Crabtree" 2/5-A fused plug

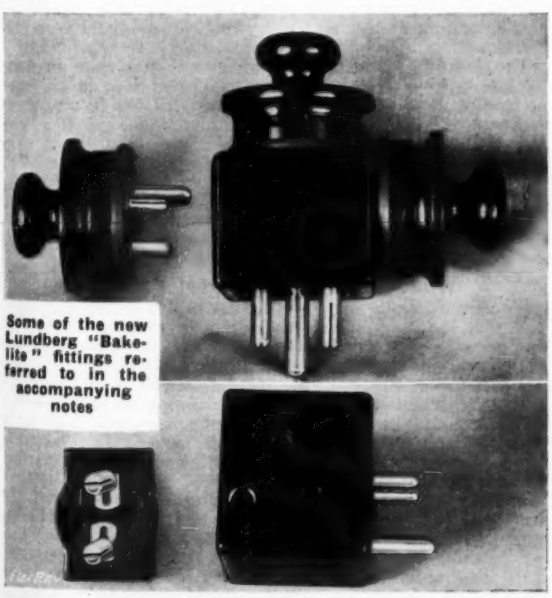
The interior is asbestos faced and a hand shield is provided. Separate chambers are provided for parts of opposite polarity and there is an adjustable cord grip on one side of the plug. The plug is designed for use with any 5-A 2-pin British Standard gauge socket.

"Bakelite" Plug and Socket Fittings

Messrs. A. P. Lundberg and Sons, Ltd., 477, Liverpool Road, Holloway, N.7, are marketing a range of all-"Bakelite" twin and triple socket plugs of standard gauges which can be used with surface, semi-recessed and flush patterns of sockets and switch plugs. In all cases the dimensions have been reduced to a minimum in order that they may be used with both side and face entry switch-plugs. All sockets and plugs are constructed in a solid one-piece moulding.

The two-pin sockets (made in 5- and 15-A sizes) may be obtained with body part alone or with two or three top entry plugs. Side entry plugs are also supplied. The adjustable pattern has the body part of the 5-A two-pin pattern, but is fitted with an adjustable device for taking different gauges of pins. By stocking a few contact pins of different gauges (.235 in., ¾ in. centres, .210 in., ⅞ in. centres, and .25 in., ⅞ in. centres are available) this pattern can be adapted to suit a particular gauge. A gauge plate can also be supplied.

The two-pin and earth pattern is available in a 5-A size for sub-circuits and either 5- or 15-A for supply pins. A feature of this type is that it is impossible to make contact by the current-carrying plugs alone. As is the case with the other models the brown "Bakelite" body parts are supplied alone, or fitted with either two or three plugs. A 2-A twin or triple three-pin socket plug of standard gauge and capacity is also available. Some of these fittings are illustrated herewith.



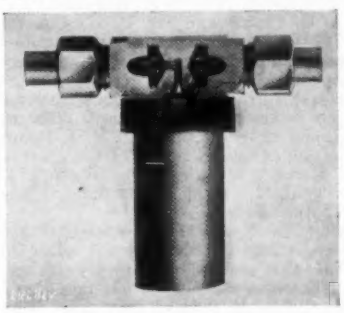
Some of the new Lundberg "Bakelite" fittings referred to in the accompanying notes

An Electric Glow Fire

A 1.25-kW electric fire, which is designed to set up a circulation of warm air and also to project radiant heat, has been produced by the Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley, Co. Durham. The fire circulates the warm air at the rate of 190 ft. per minute. The reflectors are chromium plated and the body may be obtained in art silver, art copper or art brass. It is 21¼ in. high and 12 in. wide, and can be provided, if desired, with a flame flicker effect.

An Electric Petrol Valve

An interesting new device of use to car owners is a thief-proof valve made by Messrs. Frank Smith, Basil Street, Manchester. The "Wizard" valve is fixed to the petrol supply pipe and wired to the battery of the car; it enables the driver to turn off the petrol supply from the driving seat before leaving the car, or if a fire should occur. In the event of the latter the fuse melts, automatically cutting off the petrol supply.

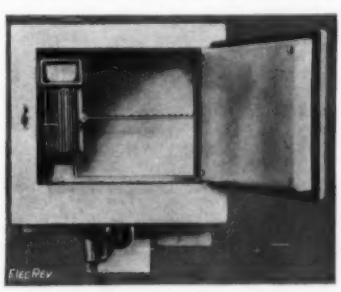


The "Wizard" electric petrol valve

The valve requires from 1½ to 2 W, the current flowing in the solenoid keeping it open. On switching off, a small sliding weight, which constitutes the valve, falls, thus closing the petrol pipe. If the switch for operating the device is effectively hidden it makes a thief-proof device. A large size with totally enclosed terminals is also available for buses and motor coaches.

The "Electrolux Minor" Refrigerator

Electrolux, Ltd., 153-5, Regent Street, W.1, has sent us particulars of a new low-priced refrigerator which it has put on the market. It is known as the "Electrolux Minor," and is 31¼ in. high, 19¾ in. wide, and has a depth of 19¼ in. The temperature is controlled by a three-way switch and the consumption is about 2 kWh per day. The "Minor" embodies the same features as other models, being entirely without moving parts. The external finish is white washable cellulose on rustless steel and the outer fittings are chromium plated. The interior is of pure white enamelled porcelain on seamless steel, the shelf being rust-proof. The refrigerator is guaranteed for two years.



The "Electrolux Minor"

An Inexpensive Iron

The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, has introduced into its range of domestic irons a new cheap model. The new iron is sold with three yards of flexible cable and a moulded b.c. adaptor. It is well finished in nickel plate and is fitted with a substantial end stand and thumb rest. The loading is 550 W and the weight 5½ lb. The thermal efficiency is said to compare favourably with that of more expensive models.

A new "Ediswan" iron

The "Talkatome"

British Talkatome, Ltd., Wells Street, Jermyn St., S.W., has produced a talking-film equipment which can be used with any of the 16-mm. film projectors now on the market. The device consists essentially of a synchronised turntable, which is attached to the projector by a flexible drive. A special sound disc is used in conjunction with the film, and this is placed on the turntable. An electrical pick-up carries the gramophone needle, and is connected to a loud speaker *via* either the user's radio set or, alternatively, a special amplifier. A simple device enables synchronisation to be obtained between film and record, and means are provided for varying the volume and quality of the sound accompanying the film.

The makers have prepared a library of films and discs, including comedies, vaudeville, travel, and educational films. The installation and operation of the equipment is simple.

The Work of the Power Companies

Speeches at first annual luncheon

FOR the first time in the twenty-seven years of its existence the Incorporated Association of Electric Power Companies came right out into the open on Monday last with a luncheon held at the Hotel Victoria, London, at which Mr. W. B. Woodhouse (Yorkshire E.P. Company) presided.

The company present included Sir Andrew Duncan, Sir John Brooke, Sir Archibald Page, Sir James Devonshire and other gentlemen representing the Central Electricity Board and the Electricity Commissioners; Sir Felix Pole, Sir Edward Iliffe, Captain Donaldson, Mr. J. S. Highfield, Mr. G. Balfour, M.P., Mr. A. C. Cramb and Mr. C. H. Cox (of E.D.A.), Brig.-Gen. R. F. Legge, also prominent manufacturers, well-known engineers and managers and other officials of the electric power companies.

Mr. R. P. Sloan (ex-president), in proposing "Our Guests," gave a hearty welcome to representatives of many different associations and interests, and in mentioning Mr. P. J. Pybus (the Minister of Transport) he expressed regret at the absence of his predecessor, Mr. Herbert Morrison, who during his period of office showed a wonderful grasp of the difficult problems of the electrical supply industry.

The speaker, in referring to Mr. Pybus's speech at the British Industries Fair regarding the detrimental effect of parochial policy, said that the power companies years ago recognised the necessity for replacing the parish pump and they had had considerable success in spite of their difficulties. But they were faced with the possibility of some of their good work being undone as the large areas might be broken up into independent and small fractions by purchase by the local authorities. This was by no means an unfounded fear but a very real one.

The Next Step

In responding to the toast, Mr. Pybus referred to Mr. Sloan's good record. In spite of the grave industrial depression which crippled the North of England last year, the Newcastle-upon-Tyne Electric Supply Co. had added to its mains connections amounting to 32,000 h.p., and had at the time of its last report orders for additional load exceeding 20,000 h.p.

We had rationalised the production and distribution of electrical energy in bulk in a manner scarcely equalled in any part of the world, and the next step was the rationalisation of our low-voltage network; distribution generally remained a problem of appalling urgency. Almost without exception the generating stations of the Associated Power Companies had been designated "selected stations" under the Central Board's regional schemes. Last year the power companies as a whole, in spite of the slump, secured for the public supply system 89,000 h.p. which had previously been supplied by some other form of energy.

At a time when the record of almost every great industry showed a steady decline over the last few years, the generation and supply of electricity had steadily advanced in this country, whereas in America and Germany there had been a material fall. But we should be deluding ourselves if we regarded the electrical industry as having more than scratched the surface of its great possibilities. No great public service like that of electrical supply could consider its work very far advanced when out of a total domestic national budget only one half of one per cent. went to pay for electricity.

A most satisfactory feature of the great schemes of organisation in electrical generation and distribution which had been accomplished during the last few years had been the manner in which the great municipal enterprises and power companies had sunk their great basic difficulties of financial structure and had joined together in the interest of the industry and consumer alike. That proved that the suggested incompatibility between municipal and private enterprise was more often imaginary than real. In that work the scrupulously fair and just activities of the Electricity Commissioners and the Central Board had played no small part.

It was urgent and necessary that steps should be taken in order that those who lived in the agricultural and more sparsely populated parts of the country should receive the benefits of the great national scheme. In many places only consolidation of undertakings could secure that economy of management and of capital expenditure which would make such progress possible.

In the main it was not legal compulsion but general good will and a real spirit of compromise in the public interest which had made the linking of power stations and the grid itself an accomplished fact, and it would be a thousand pities if the same spirit of compromise applied to the 600 distributing authorities in this country could not, too, accomplish their work without any compulsion being necessary.

Presidential Address

In the course of his presidential address, which followed, Mr. W. B. Woodhouse remarked that to-day there was general appreciation of the wisdom that Parliament displayed 30 years ago in creating electric power companies to generate electricity on a large scale and to transmit it over wide areas through unified systems.

In the years that had intervened legislative opinion had vacillated, so that private enterprise had been hampered, and progress made extremely difficult.

The power companies had a territory of over 24,000 sq. miles, in which they had expended about £50,000,000 in providing supplies of electricity. They had, moreover, by the establishment of and association with distribution companies, extended their operations to deal direct with all consumers in even wider areas, so that they were now supplying approximately one quarter of the electricity sold in this country at an average price of ¾d. per kWh.

Their experience was the foundation of present-day methods of supply, and the great scheme of interconnected generating stations which would soon be in operation under the control of the Central Electricity Board, would effect on a national scale what the power companies set out to do in their areas.

The scramble for territory was over; the unification of the smaller undertakings with larger organisations had progressed substantially; and, given freedom from disturbance of tenure, the prospect of expansion before the industry was so great that at present one could see no limit to it.

[*Elliott & Fry.*]

Mr. W. B. Woodhouse

While domestic and lighting uses of electricity had quadrupled in the last eight years, the total cost to the user has only increased at half that rate, and in 20 years the average price of electricity for domestic use had been reduced by two-thirds.

Lest they should be unduly impressed by a sense of the industry's present importance or of their distinction, it might be useful to remember that the total revenue received from the sale of electricity for all purposes in this country was about half the amount spent on tobacco, that the sale of electricity for domestic purposes was only half of the public expenditure on tea, and that in the domestic budget on an average only half of one per cent. went to pay for electricity.

On the other hand, the expenditure on coal, electricity, gas and candles for domestic heating and cooking and lighting amounted in total to nearly seven times the domestic electricity bill, and he would be indeed a pessimist who did not foresee a larger and larger proportion of this being diverted to the purchase of electricity.

Concentration of Generation

The present stability of the industry was largely due to the careful expenditure of capital in the past and the avoidance of duplication. The world depression emphasised the need for the power companies to continue that careful policy whilst pursuing with the same energy as in the past their original objects of concentrating generation at the most efficient centres, and extending distribution everywhere on a sound economic basis.

The industry supplied the public with a service in competition with alternatives in nearly every case; in all cases in face of rapidly changing conditions. In the future, as in the past, efficient service of the public would call for uninterrupted progress; every new invention, every use of electricity, every piece of apparatus must be considered in relation to the public requirements, and research, maintenance, and replacement must be on a scale which would keep the industry ahead of progress and assured of continued development. Such a service and such an ideal were fundamentally those for individual enterprise.

Wonderful Progress: Greater Future

Sir Edward Iliffe, in proposing the health of the chairman, said that in these difficult times it was good occasionally to find oneself among a body of enthusiasts. They knew as power companies that they had something to sell which would work wonders for British industry and for British country life.

They represented great progressive companies in which the public had invested many millions of money, and they were co-operating in an attempt to bring before the nation the value of the services which they were willing and able to render. Few, apart from themselves, knew how many years it took to convince Parliament that their projects would assist the industrial well-being of the country and would, in addition, earn reasonable profits for shareholders.

Something like 20 and more years ago they were engaged in pioneering efforts before Parliamentary Committees; those were the days when municipal electrical claims and the rights of small companies were considered paramount. Their argument in favour of cheap electrical energy in the end prevailed.

He had been looking through the records of their progress. Certainly considering everything it had been wonderful in 1931; but while they were profoundly impressed with what had already been accomplished, they knew that, as Mr. Pybus had pointed out, it was small in comparison with what remained to be done. The power companies were helping materially to modernise British industry at the present time and were providing a solution of the problem of how to get the people back to the country. They also had the means for revolutionising farming.

The Contractor's Storekeeper. By H. R. Taunton

A small amount of clerical work is unavoidable

THE storekeeper should *not* be a clerk. He is much better employed in systematising his stock in physical fact than on paper. If he does his manual work properly he will have little time to spare for penmanship and complicated figuring. At the same time, a certain amount of clerical work is unavoidable, but it should be as little and as elementary as possible, and never allowed to encroach unduly on his more important functions.

The keeping of a system of bin cards, an almost indispensable aid to accuracy in stock listing, will be one of his chief duties. This is in effect a skeleton stock list kept by him, and tallying as to quantities with the official stock list kept in the office and with which he has nothing to do—although he may, for convenience of reference, have a carbon copy of the annual stock list.

Following the principle that his clerical work should be kept to a minimum, the best system of bin cards is the simplest. Every bin or other receptacle in the store should have its card, and if the bin contains more than one type of goods it should be given a separate card for each type. The cards, of stout manilla, can be conveniently in two parts: one permanent, tacked or glued to the bin, the other renewable, in a simple metal frame or holder, itself fixed to the bin.

A suitable size for these cards is about 3½ in. by 2½ in. The permanent half will carry in large figures the bin number, a full description of the bin contents copied from the corresponding entry in the stock list, and, also in bold figures, a note of the agreed maxima and minima. The renewable card may be either plain or, better, ruled into rectangles, say, for the size suggested, six each way or 36 in all.

The quantity in the bin at the time a new card is inserted in the holder is noted in the first space. Whenever a lot is added to or taken from the bin the altered balance is noted in the next space, the preceding one being cancelled; so that at any moment the bin card will show the actual quantity in stock of the goods to which it refers.

Advantages of the System

It will be seen that the storekeeper is not troubled with the rates, dates or references shown in the office stock list. It would certainly be a further check on accuracy if the bin cards recorded references to advice notes or job numbers; but the further expenditure of time and trouble would inevitably lead to gradual disuse. Better to be content with the one simple but valuable record of quantities: something which the most casual of storekeepers will have no excuse for neglecting, to be made automatically at the time the bin is visited.

The advantages provided by a bin card system are an up-to-the-minute indication of stock quantities; a warning of approach to maximum and minimum limits; a check on the perpetual stock list kept in the office; and the avoidance of the long-drawn-out dislocation of the usual annual stock-taking by laborious counting.

If the cards are correctly kept, no general counting is necessary. It will be sufficient to count a few bins at random to check the fact that they *are* kept correctly. The annual stock-taking is then simply a matter of copying the figures shown on each card. This can be done in an hour or so, on the last day of the trading year, the actual enumeration of the items having been typed out beforehand.

The random counting of a certain number of bins is necessary, as although it might be assumed that the bin cards were correct if they tallied with the perpetual stock list, independently compiled, that would be no proof that the bin contents agreed with either. It might be short of the figures recorded through losses or breakages not noted, or even through deliberate dishonesty.

Relations of Office and Store

The smooth functioning of any system of stock keeping and listing depends on a close liaison between the stores and the office. Apart from ordinary telephone and verbal communications, this liaison consists officially of certain necessary records in writing on standard forms, and may here be conveniently summarised. All movements of stock are initiated:

(*a*) If *outwards*, by requisition (i) from foreman, either posted to the office or handed into the stores; or (ii) from showroom or office.

(*b*) Or by credit advice note to suppliers, of surplus material, with copy to office.

(*c*) If *inwards*, by order, issued by office.

(*d*) Or by return note, from foreman, of material surplus to a contract or job.

Orders and advice notes, requisitions and return notes, their forms and the routine connected with them, do not here concern us, and we must assume that no defects in their organisation can be held responsible for a breakdown in that of the stores, which is our present subject. The final records of the above movements, from which the necessary entries in the cost ledger and the stock list are made, take the form of:—

(*a*) *Outwards*. A delivery note (i) to foreman, with copy to office; or (ii) to customer, with either a cash sales voucher or, in due course, an account.

(*b*) A credit note from suppliers for goods returned.

(*c*) *Inwards*. An advice note and subsequent invoice from suppliers for goods ordered and received.

(*d*) The foreman's return note, after checking by stores, and passing to office.

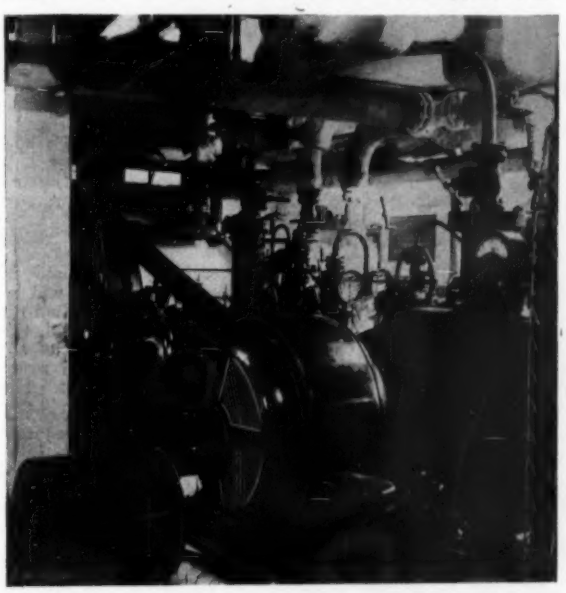
Purely Routine Work

Here again we are not concerned with the forms and the routine necessary to the proper handling of invoices, advice notes and the rest. It is sufficient to emphasise the necessity for the routine laid down in each case to be followed fully and exactly by both the departments concerned, neither attempting to evade its own responsibility nor to encroach on that of the other.

Under this system the staff is only called upon to do purely routine work, and nothing but thoroughness and accuracy are required. The only other clerical work necessarily done there is:—

(*a*) Advising when any item of stock approaches the minimum limit, so that the office may issue the necessary order to renew it.

(*b*) Writing certain orders for jobbing work, if the normal routine of the business makes it desirable that the storekeeper should be authorised to do this. Generally, however,



Electricity in the Dairy (see p. 588). Electrically driven ammonia compressors

it is better that only the buyer or certain principals in the office should be allowed to write, or at least sign, orders.

(*c*) The keeping of a record of all tools and tackle, the property of the firm and kept in the stores or otherwise, and issued from time to time for the use of men on contract work.

(*d*) Petty work in connection with parcel books, railway notes, labels, and so on.

(*e*) Minor correspondence with suppliers and foremen arising from the routine of the stores. It will be obviously a great assistance to the office staff, relieving them of a mass of petty detail, if the storekeeper is capable of writing or dictating clearly expressed letters on such matters as delays, errors or shortages in deliveries, or obscurities or other difficulties in requisitions. All such letters should be signed, or at least read before posting, by a responsible member of the office staff. They may either be written in longhand in a suitably printed memo-book with perforated originals and duplicate sheets for carbon copies, or they can be typed in the ordinary way.

All that has been said in this and previous articles on the organisation of stores and stock will be seen on analysis to be no more than a methodical survey of what is, in theory if not in practice, the organisation current with most of the experienced firms of electrical contractors. To some it may seem unnecessarily complicated, and to involve what they may dub "red tape." Actually, there is nothing in it which cannot be carried out smoothly by an average staff, and, far from increasing their labour, it will be found to reduce it to an easy routine.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Birkenhead Corporation and Electrical Contractors

"Fair play for Birkenhead electrical contractors" was the keynote of a speech by the chairman of the Birkenhead Electricity Committee at the last Town Council meeting, when it was moved that the carrying out by the Electricity Department of any wiring in houses or factories except under the assisted wiring scheme and the deferred payment system, and work on Corporation property should be discontinued; that for a trial period of twelve months discounts be allowed to local contractors in respect of goods purchased on the hire-purchase system from the electricity showroom by customers introduced by such contractors; and that as regarded installations under the assisted wiring schemes tenders be invited from local contractors and from the electrical engineer for the carrying out of the work to a common specification, to be approved by the Committee. Mr. Toosey said that in the opinion of the Committee electrical contractors had been treated unjustly for several years. The Corporation now expected contractors to work in direct contact with the Corporation showrooms. Although it might be argued that the Corporation would lose money in some cases, he maintained that in the long run the Corporation would benefit. Assisted wiring work would be let out to public tender, and they were going to make the conditions identical for the contractor and the Electricity Department.

Manchester and Electrical Contractors

In connection with the Manchester Corporation prepayment wiring scheme, the Electricity Committee decided twelve months ago to place the installation work with seven electrical wiring contractors. This arrangement was not considered satisfactory to some of the other contractors in the city. It has now been decided by the Electricity Department to throw open the scheme to all electrical contractors on the Department's permanent register.

Indian Electrical Imports

The imports of electrical apparatus into India are estimated to have amounted to a value of £108,225 during last year, as compared with £123,750 in 1930.

British Exhibition in Denmark

On September 24th an all-British exhibition organised in Great Britain by the Federation of British Industries will be opened in Copenhagen. All exhibits must be the product of, or manufactured in, Great Britain and Northern Ireland, the Dominions, Colonies or Dependencies, and exhibitors are asked to use to the greatest degree possible British made materials throughout in stand fitting and equipment. The exhibition will be held in the "Tivoli," the "Forum" and in the Industries Hall, and will be the largest and most important all-British exhibition ever held on the Continent. The opportunities offered to British manufacturers are extensive. In 1931 only 15 per cent. of the total imports into Denmark came from Great Britain, and apart from the chances of those firms who already do business in the country increasing their trade there are many new markets into which British manufacturers can reasonably hope to enter. Full particulars of the exhibition may be obtained from the organising secretary, Exhibition Section, Federation of British Industries, 21, Tothill Street, Westminster, S.W.1.

Argentine Duties on Meter Parts

The Argentine Government has increased the official customs valuation of parts for electricity meters, such as connections, armatures, binding posts, &c., to 9 gold pesos per kg. The import duty is 25 per cent., plus a surtax of 7 per cent. of the official valuation, plus a provisional additional duty of 10 per cent. of the official valuation, to be effective throughout 1932.

Goblin Window Display Competition

Some very interesting and attractive window displays were arranged in a recent competition organised by British Vacuum Cleaner and Engineering Co., Ltd. The first prize of £100 was divided between Flexteel of Southsea and the Leeds Industrial Co-operative Society, Ltd., while the second prize of £25 went to Messrs. Hamer & Co., Ltd., of Halifax. Thirty other prizes to the value of £125 were awarded for other outstanding "Goblin" displays in all parts of the country.

Railway Construction in Russia

In his opening speech at the first meeting of the recently appointed committee for the reconstruction of the Soviet railway system, M. Andrejev, the chairman of the committee and Soviet Commissioner of Transport, stated that three locomotive factories were now being built—at Lugansk (Donetz Basin) and in Siberia and the Ural region. The Chussovaya-Kizel railway line and the Suram Pass line in the Caucacus would be electrified this year, and the construction of a factory for electric locomotives had been decided upon. *Reuter's Trade Service* learns from Berlin that at the committee's second meeting, on April 25th, the general scheme for the second five-year plan of Soviet railway construction will be settled.

A Battery Company's Claim

In the King's Bench Division on April 14th, Mr. Justice Goddard had before him an action by the London Battery and Cable Co., Ltd., Leytonstone, against Mr. Heathcote, trading as the Dulstone Die Casting and Engineering Co., for the

British Overseas Electrical Trade in March

THE effects of the introduction of import duties are very obvious in the Board of Trade returns for March, from which the appended table has been compiled.

An analysis of the electrical machinery market shows that there was an increase of £37,436 as compared with the preceding month, this being principally due to increased purchases (£183,479, against £112,097) by European countries. New Zealand (£14,077), Canada (£11,514), South Africa (£29,474), South America (£20,116), and Japan (£937) were also better markets; but shipments to British India (£50,726), Australia (£6,396), and "other countries" (£33,015) showed severe declines of £17,917, £18,907, and £15,620 respectively.

Compared with March, 1931, there was an all-round decrease, except in the case of European countries, whose share of the exports rose from £72,865 to £183,479; the most serious declines were recorded in the purchases of British India (which fell from £86,882 to £50,726), Canada (from £39,282 to £11,514), and "other countries" (from £67,579 to £33,015).

	Exports.			Imports.			Re-Exports.		
	Electrical exports for March, 1932.	Inc. or dec. as compared with Feb., 1932.	Inc. or dec. as compared with March, 1931.	Electrical imports for March, 1932.	Inc. or dec. as compared with Feb., 1932.	Inc. or dec. as compared with March, 1931.	Electrical re-exports for March, 1932.	Inc. or dec. as compared with Feb., 1932.	Inc. or dec. as compared with March, 1931.
Insulated wires and cables ..	£ 95,933	– £12,852	– £22,569	£16,744	– £43,848	– £40,389	£185	– £30	– £33
Electric carbons	1,144	– 2,011	– 4,393	3,034	– 2,999	– 14,941	59	– 504	– 678
Arc lamps and searchlights ..	217	– 179	– 512	—	—	– 173	134	+ 95	+ 125
Incandescent lamps	30,095	+ 3,306	+ 181	9,699	+ 535	– 9,833	499	+ 27	+ 328
Other lighting apparatus ..	22,890	– 4,659	– 14,793	15,752	– 4,309	– 17,105	2,842	+ 1,818	+ 1,690
Batteries and accumulators ..	48,764	+ 11,007	– 14,115	6,754	– 10,572	– 34,135	16,380	+ 16,010	+ 16,054
Meters and instruments ..	39,625	+ 11,778	+ 15,692	27,509	– 22,330	– 4,524	732	+ 456	+ 293
Unenumerated goods and apparatus	91,974	+ 4,942	– 66,096	41,527	– 42,504	– 47,396	2,300	– 583	– 2,477
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)..	18,663	+ 6,264	– 63,892	672	+ 455	– 1,904	261	+ 261	+ 112
Submarine telegraph and telephone cables	2,623	– 2,720	– 20,492	—	—	—	—	—	—
Telegraph and telephone apparatus	138,120	– 16,035	– 91,933	38,264	– 5,050	– 65,645	4,065	+ 302	– 4,634
Electrical Machinery—									
Railway and tramway motors	10,261	+ 704	+ 3,101	—	—	—	—	—	—
Other motors and generators	128,985	+ 32,470	– 1,542	—	—	—	—	—	—
Unenumerated electrical machinery..	210,488	+ 4,262	– 36,935	82,346	– 7,155	– 30,298	12,049	+ 189	– 1,121
Total..	£839,782	+ £36,277	– £318,298	£242,301	– £137,777	– £266,343	£39,506	+ £18,041	+ £9,459
Decreases for the first three months of the year.. ..		Exports. £1,156,937			Imports. £624,038			Re-exports. £24,377	

return of £175 paid in respect of the delivery of an automatic die-casting machine for making lead plates used in accumulators.

Plaintiffs' case was that the defendant failed to carry out his contract to install and run the machine at their works and they therefore cancelled the order, as they said they were entitled to do, and the defendant became liable to repay £175 which they had paid on account. Defendant applied in person and alleged that the contract was varied verbally.

His Lordship held that the contract was not varied. When the defendant refused to work the machine plaintiffs were entitled to cancel the contract and they were entitled to the return of their £175 with costs. Judgment was entered accordingly.

A Travelling Electrical Show

With the object of popularising the use of electricity a combined display has been arranged by British Insulated Cables, Ltd., and the Shropshire, Worcestershire and Staffordshire Electric Power Company. This consists of a travelling exhibit of B.I. cables and accessories and includes a motor-driven revolving electric sign representing the B.I. trade mark, built up with samples of main cables, a monster model of a 3-core paper insulated cable and a display of cables and flexible cords in various stages of manufacture. A showboard of one of the B.I. wiring systems is also included and serves to feed various domestic appliances. Appropriately worded display cards urge the spectator to use electricity. The exhibits are being shown for periods of a fortnight at each of the principal showrooms of the power company.

The B.I.-S.W.S. travelling exhibition

Electrical Development in Dumfries

The Electricity Committee of Dumfriesshire County Council is displaying great enterprise in its effort to popularise electricity in the county. Major Crabbe, of Duncow, the convener, has already explained the scheme at over 30 meetings. A further development of this propaganda work is the equipment of a demonstration van to tour the county. The vehicle, which is an old Tilling-Stevens bus, reconditioned to plans by Mr. J. S. Pickles, the county electrical engineer, generates the electricity required to demonstrate the articles on view. Appliances exhibited include a cooker, kettle, wash boiler, washing machine, water heater, and pump. It is intended to vary the exhibits periodically and, later, to include appliances useful for farming operations. Demonstrations of electric cooking are given.

The " E.S.B. Bulletin "

The publication by the Irish Free State Electricity Supply Board of a bright little monthly journal called the " E.S.B. Bulletin " is certain to meet with approval. The first number contains an interesting article on " The Shannon Power Scheme and Industrial Development " and, besides a number of topical news items, there are accounts of the E.S.B.'s social and athletic activities, competitions, &c.

Electrical Cooking at New Woolworth Building

Caterers will find much to interest them at the new premises of Messrs. F. W. Woolworth & Co., 311, Oxford Street, W., where an all-electric kitchen and bakery has been installed. On page 599 will be found illustrations of some of the equipment. In the kitchen, besides a large oven specially for roasting meat, there are six double-oven ranges for general purposes with hot-plates and grillers above. Over 2,500 pieces of fish are cooked each day in two two-pan fryers (18 kW each), similar apparatus being employed for frying potatoes. Other kitchen equipment includes electric grillers, steamers and mixing machines. In the bakery are two large baking ovens, steamers, provers, a mixing machine, a doughnut fryer and a pie machine. All the cooking apparatus is of G.E.C. manufacture.

The ventilating system of the building is also worthy of mention. Air before entering the ventilating shafts is cleaned by passing through oil filters and then electrically warmed. Messrs. H. W. Dutton & Co., Ltd., supplied the ventilating plant, Scott motors and Ellison switchgear being employed. The electrical work in connection with the installation of the plant, as well as the wiring for the lighting, &c., throughout the building, was carried out by Messrs. Grierson, Ltd.

Employment During March

The *Ministry of Labour Gazette* states that employment in the engineering industry as a whole showed an improvement during March, but was still bad. The total number of unemployed decreased from 271,505 to 258,890, and the proportion from 27 to 25.8 per cent. In the electrical engineering section there was also a slight improvement, the number of unemployed declining from 15,892 to 15,382, and the percentage from 17.2 to 16.6. There were decreases in the cable, wire and lamp manufacturing groups from 15,831 to 15,103 (14.6 to 13.9 per cent.), and in the electrical wiring and contracting industry from 4,563 to 4,235 (from 20.3 to 18.9 per cent.).

New Swiss Companies

Among the new concerns recently formed in Switzerland are the Elrad Gesellschaft, Berne (5 Hirschengraben), to manufacture electrical and wireless apparatus; the Ruro Gesellschaft für Elektrische Spezialapparate, Zurich (83, Schaffhausenstrasse), and La Société des Interrupteurs Mercuria, La Chaux de-Fonds (82, Rue Leopold Robert), to manufacture mercury rectifiers and to take over certain patents from M. Jules Schneider.

Ward and Goldstone, and Remax, Ltd.

Messrs. Ward & Goldstone, Ltd., and Remax, Ltd., who have been associated in the London district for the past three years, have decided to act entirely independently of each other. Both concerns find it necessary to provide increased accommodation to cope with the growing volume of trade, and furnish facilities for holding larger and more varied stocks. Messrs. Ward and Goldstone, Ltd., are taking new premises as from April 30th, 1932, at 5, Percy Street, Tottenham Court Road, W.C.1, while Remax, Ltd., will retain its present premises.

Radio Apparatus in Lithuania

A confidential report on the market for radio apparatus in Lithuania, based on information received from the British Consul at Kovno, has been issued by the Department of Overseas Trade to firms whose names are entered on its special register. United Kingdom firms desirous of obtaining a copy of the report should apply to the Department, 35, Old Queen Street, S.W.1 (reference No. A.X.11,323).

" Heatrae " Propaganda

As a means of attracting public attention to the merits of its electric water heaters, Electric Fires, Ltd., are now supplying a well-made hot water bottle, on the corner of which is the injunction : " Fill me from the Heatrae electric water heater."

New Electrical Showrooms

The Gillingham (Kent) Town Council has applied to the Electricity Commissioners for sanction to meet the cost of an electricity showroom at Rainham (£1,072), plus approximately £100 for fittings, out of revenue.

The St. Helen's Corporation is to open new electricity showrooms in Bridge Street.

Conference on Family Allowances

A two-day conference on " Family Allowances " is to take place at the London School of Economics on April 29th and 30th. Sir William Beveridge will open the first session by an address on " Some Economic Aspects of the Family." Tickets for the conference (price 1s.) and particulars are obtainable from the secretary, Family Endowment Society, 52, Romney Street, S.W.1.

For Sale

A turbo-alternator is offered for sale by the Acme Spinning Co., Ltd.

Mr. G. R. Lightfoot is to sell electrical equipment by auction on May 4th at 13, High Holborn, W.C.2.

(See our advertisement pages to-day.)

Non-machinery Accidents

At a meeting arranged by the London Industrial Committee of the National " Safety First " Association, held last week at the Institution of Mechanical Engineers, Mr. Leonard Ward, H.M. Senior Engineering Inspector of Factories, gave an address upon the subject of " Non-Machinery Accidents." Mr. A. Ronca (chairman of the London Industrial Committee) pre-

sided. The lecture dealt with the common causes of many accidents under different causation groups and means for their prevention, and was illustrated by lantern slides.

Prices of Materials

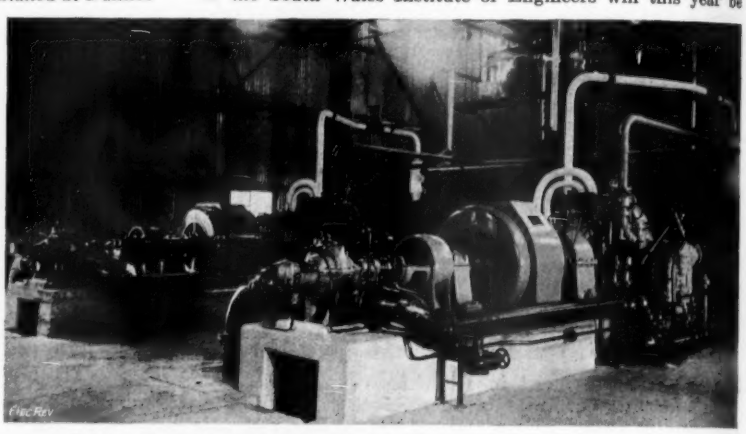
Messrs. Edward Till & Co. report, April 20th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, April 20th: Copper bars (best selected), sheet and rod, no change. English pig lead, £13 10s., 10s. inc.

Messrs. F. Smith & Co. report, April 20th: Electrolytic copper, h.c. wire, 6 5-16d., 1 1-16d. inc. Silicium bronze wire, 7 15-16d., 1-16d. inc.

A Metro-Vick Installation in Burma

The accompanying illustration shows two Metropolitan-Vickers self-contained turbo-generator sets installed at Dunneedaw, Rangoon, for the Bombay-Burma Trading Corporation. A third identical unit is on order and in course of manufacture. The sets are each of 550-kW m.c.r. and are designed for steam conditions of 200 lb/sq. in gauge, 200° F. superheat, the speed being 6,000 r.p.m. The turbines are coupled through single reduction double helical gearing to alternators running at 1,000 r.p.m. and designed for 3-phase 50-cycles 400V. The condensers, which are of the surface type, are formed integral with the turbine exhaust casing, and each has a cooling surface of 422 sq. ft. Both circulating water and condensate extraction pumps are mechanically driven from the main sets, the former by an extension of the generator shafts and the latter by a downward extension of the governor spindle. The ejectors, which are of the two-stage type, are mounted on the inlet circulating main with the coolers arranged in the water flow. Sets of this type are capable of very rapid starting up and of easy control while a complete absence of separately driven auxiliaries makes for maximum simplicity and overall efficiency.



Self-contained Metro-Vick turbo-generator sets installed in Rangoon

Recent Contracts

The British Broadcasting Corporation has placed a contract with the Radio Communication Co., Ltd., for the supply and erection of two 500-ft. lattice steel masts at the West Regional Station, Watchet, similar to those recently built by the same company for the North Regional and Scottish Regional Stations.

The London, Midland and Scottish Railway Co., Ltd., has placed a contract with the General Electric Co., Ltd., for twelve months' supply of Osram gasfilled and vacuum lamps, and Robertson carbon filament lamps.

The Telegraph Condenser Co., Ltd., has been awarded a contract for 2,000 condensers for power factor correction, which are to be connected across motors on farms in the area of the Thames Valley Electric Power Board, New Zealand. This order was obtained against competition from various condenser manufacturers both British and foreign.

The British Thomson-Houston Co., Ltd., has received contracts from the Port of London Authority for the supply of vacuum and gasfilled lamps for three months ending June next, and from the L. & N.E. Railway Co. for a supply of lamps for the year ending April, 1933.

Trade Announcements

The business of Messrs. Lawrence & Nicholas, electrical factors and agents, 208, Chapel Street, Salford, has been purchased by Mr. Lawrence. The agency of the Metallic Seamless Tube Co., Ltd., has been renewed with Mr. Lawrence.

Extensive alterations have now been completed at the premises of the Albion Electric Stores at 4, Alfred Street, Leeds, and new electrical and wireless showrooms have been opened.

Following the complete amalgamation of the Crypto Electrical Co., Ltd., with the Lancashire Dynamo & Motor Co., Ltd., the companies' Canadian associate has changed its name to the Lancashire Dynamo and Crypto Co. of Canada, Ltd.

The Marking of Imported Lamp Casings

An application by the Ever-Ready Co. (Great Britain), Ltd., and the Efandem Co., Ltd., for the marking of imported casings for dry and secondary battery portable electric lamps, lanterns and torches came before the Standing Committee appointed by the Board of Trade on April 18th. For the applicants it was claimed that over 90 per cent. of the articles covered by the application produced in this country were manufactured by the two companies. With the exception of American imports, the casings imported had no mark of origin, and only in a few instances were the containers marked "foreign." The applicants asked that the several kinds of imported portable electric lamps should be marked "foreign," and evidence was given in support of their application.

Production and Distribution

The chief guest at the luncheon of the Batti-Wallahs' Society held on Tuesday last was Sir Francis Goodenough (Gas Light and Coke Co.), who gave an address on "Things We Have in Common." He said that those engaged in the electrical and gas industries were merchant adventurers who sometimes came up against one another in a royal but clean fight. Both industries were inclined to think too much of production and too little of distribution. The manufacturer and producer were too prone to leave the distribution and selling organisations to look after themselves. The consumer provided the money to pay the producer, the manufacturer and the workman, and must therefore be cultivated. This was one of the weaknesses of the country as well as of the two industries, and it was in this direction that we had failed in overseas trade during the last 25 or 30 years. We had relied upon our reputation to maintain our share of the markets, while other countries had assiduously cultivated them.

Cardiff Engineering Exhibition

The engineering exhibition held at Cardiff under the auspices of the South Wales Institute of Engineers will this year be held at Greyfriars Hall from November 23rd to December 3rd. Firms wishing to exhibit may obtain particulars from Mr. Martin Price, secretary of the Institute, Institute Buildings, Park Place, Cardiff. The exhibition is largely electrical in character, and mining equipment usually predominates.

New Catalogues and Lists

C. Bedford & Sons, Ltd., 336, Gray's Inn Road, W.C.1.—A leaflet describing the "Villa" vacuum cleaner.

Ionic Alkaline Batteries, Ltd., 26, High Street, Stratford, E.15.—A folder giving particulars of the "Ionic" hand inspection lamp.

Drayton Regulator & Instrument Co., Ltd., West Drayton, Middlesex.—List No. 171, dealing comprehensively with the company's automatic control equipment. Some interesting diagrams illustrate the simplicity of installation and the adaptability of the apparatus to varying requirements.

Renold & Coventry Chain Co., Ltd., Renold Works, Didsbury.—A booklet of chain driving diagrams (No. 116/02).

English Electric Co., Ltd., Stafford.—Publications No. 36 and 38, dealing respectively with truck switchgear and induction voltage regulators.

Higgs Motors, Witton, Birmingham.—A stock list (No. 151) of electric motors.

L. Benn & Co., Ltd., 8, Colonial Avenue, Minories, E.C.3.—A leaflet describing the new British-made "Demon" vacuum cleaner.

Capel & Co., Ltd., XL Engine Works, Colchester.—List D.G., giving particulars of the company's compression ignition engines.

Constructors, Ltd., Nickel Works, Tyburn Road, Erdington, Birmingham.—A folder illustrating the adaptability of slotted steel and cable hangers.

"R.N." Diesel Engine Co., 24, Harrison Street, W.C.1.—List No. 38, dealing with high speed Diesel oil engines suitable for marine and other purposes.

Euston Electrical Supplies, 310a-312a, Euston Road, N.W.7.—A net price list (A132) of electrical contractors' supplies and accessories.

Blackstone & Co., Ltd., Stamford.—Publications illustrating and describing high speed Diesel oil engines and petrol and paraffin lighting sets.

R. G. Dixon & Co., Ltd., 116, Victoria Street, S.W.1.—An illustrated leaflet relating to the new "Vampire" vacuum cleaners and "Hobby" floor polishers (A.E.G. products) for which the company is the sole concessionaire.

The Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.—An illustrated list of reduced prices for radiant fires.

Hailwood & Ackroyd, Ltd., Morley, near Leeds.—Two leaflets (GX. 151/5 and HW. 30/3) showing some of the latest designs of "Hailware" lighting units and glassware.

Klaxon, Ltd., 36, Blandford Street, W.1.—A leaflet dealing with the "Klaxon" staff locator.

Venner Time Switches, Ltd., Kingston By-pass Road, New Malden, Surrey.—An illustrated catalogue, giving detailed particulars of the company's prepayment meters.

George Ellison, Ltd., Perry Barr, Birmingham.—Pamphlet No. 121, describing the "Bantam" star-delta starter for a.c. squirrel-cage motors.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—Several publications relating to vacuum cleaners, irons, fires, kettles, tubular heating, &c.

Bankruptcy Proceedings

P. R. Andrews, electrical engineer, Middleton Street, Wymondham, Norfolk.—The public examination took place at the Shirehall, Norwich, on April 12th, when a statement of affairs was submitted showing gross liabilities of £2,443, with net assets of £1,362. The debtor said that, although trade was fairly good, he had been handicapped through lack of capital. He did not become aware of his position until creditors began to press. He had been endeavouring to dispose of his property, which had been valued at £1,250. The hearing was concluded.

A. J. Gridley (trading as A. J. Gridley & Co.), electrical engineer, 170, Stockwell Road, S.W.—The public examination was held on April 14th at the London Bankruptcy Court, the accounts showing total liabilities of £583 (ranking £388) and assets of £17, after deducting £70 for payment of the preferential claims. The debtor stated that his failure was caused by general trade depression. The examination was concluded.

W. E. Bowles (trading as "Electrocrafts"), electrical engineer and wireless dealer, 5, Bellevue Parade, Wandsworth Common, London.—The first meeting of creditors was held at 29, Russell Square, W.C., on April 18th. A statement of affairs showed liabilities of £213, with assets estimated at £7, leaving a deficiency of £206. The debtor attributed his failure to "lack of capital and profits from the business being insufficient to cover overhead charges." The case being a summary one was left in the hands of the Official Receiver as trustee.

L. C. Shearley, electrical contractor, 2a, Dornberg Road, Blackheath, lately trading as "Electricity," 23a, London Road, Bromley.—The first meeting of creditors took place on April 18th at 29, Russell Square, W.C., when a statement of affairs was submitted which showed liabilities of £709, with assets valued at £11, leaving a deficiency of £698. The debtor attributed his failure to "profits from the business being insufficient to cover overhead charges." The case being a summary one was left in the hands of the Official Receiver as trustee. The following are the principal creditors:—Mrs. Burnside, £200; Mrs. Hollands, £60; Miss Keeble, £50; and Baxter & Caunter, Ltd., £52.

A. E. Zeumer (trading as Movitone Radio Co.), 660A, Holloway Road, N.—The public examination was held recently at the London Bankruptcy Court before Mr. Registrar Mellor, the accounts showing liabilities amounting to £316 and assets "nil." The debtor attributed his insolvency to bad trade, keen competition, and heavy establishment costs. The examination was concluded.

J. Vigon (Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.—Receiving order made April 11th on debtor's own petition. First meeting April 25th, and public examination June 21st, both at Bankruptcy Buildings, Carey Street, W.C.

W. V. Longthorp (Evans & Co.), wireless retailer, Farnham Road, Slough, and at Windsor.—First meeting April 25th at 3, The Forbury, Reading. Public examination May 20th at the Town Hall, Windsor.

B. Marsh, electrician, 17, Victoria Road, Brighton.—Last day for receiving proofs for dividend April 29th. Trustee, Mr. R. W. Cave, 3, Old Steine, Brighton, Official Receiver.

C. R. Dodd, wireless and electrical engineer, 63, Ansdell Road, Blackpool.—Receiving order made April 7th on debtor's own petition.—First meeting April 26th at the Official Receiver's office, 9, Cannon Street, Preston. Public examination May 6th at the Court House, South King Street, Blackpool.

F. M. Emerson, wireless dealer, 120, Cape Hill, Smethwick.—First meeting held April 21st. Public examination April 29th at the Law Courts, Lombard Street West, West Bromwich.

H. G. Edghill, electrical and wireless engineer, 13, Wembley Hill Road, Wembley, Middlesex.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C., Official Receiver, released March 14th.

R. E. Lomas, electrical and radio engineer, 24, Tower Street, King's Lynn.—First and final dividend of 1s. 10d. in the £, payable April 25th, at the Official Receiver's office, 41, Sidney Street, Cambridge.

Company Liquidations

Indian & Colonial Supply Association, Ltd., dealers in electric lamps and batteries, 83-85, Farringdon Street, E.C.—The statutory first meetings of the creditors and shareholders of this company (in liquidation) were held on April 13th at the Board of Trade Offices before Mr. J. Barwick Thompson, assistant Official Receiver. A statement of accounts was submitted showing total liabilities of £5,753 (unsecured, £1,790) and assets of £2,060. The failure of the company was attributed to depreciation in sterling, which caused restriction of credit by foreign suppliers; to large returns of goods through delivery contrary to instructions; and to the "Buy British" movement. A resolution was passed for Mr. D. A. Jacobs to act as liquidator, assisted by a committee of inspection.

Langham Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. C. C. Lyon, 69, Leadenhall Street, E.C.

Modern Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. A. Walton, 7, Bond Place, Leeds.

Onward Electrical Appliances, Ltd.—Winding up voluntarily. Liquidator, Mr. M. G. Hacker, 329, High Holborn, W.C.

Wadebridge & District Electric Supply Co., Ltd., and **Farringdon Electricity Supply Co., Ltd.**—Meetings May 23rd at Broad Sanctuary Chambers, Westminster, S.W., to receive an account of the winding-up by the liquidator, Mr. H. Fraser.

Private Arrangements

A. W. Rodgers (trading as Webb & Rodgers), electrical engineers, 34, King Street, Bristol.—A meeting of creditors was held recently when a statement of affairs was submitted which disclosed liabilities of £397, all due to unsecured creditors. In addition there were fully secured creditors for £65. The assets were estimated to realise £101, from which had to be deducted preferential claims of £18, leaving net assets of £83, or a deficiency of £314. The creditors resolved that the estate should be realised under a letter of authority in favour of Mr. Curtis, of Messrs. Ware, Ward & Co., and after payment of preferential creditors, suing creditors' costs in full and charges, the balance to be distributed *pro rata* amongst the creditors.

Electricity Supply

Lighting, Domestic, Power

Acton.—REDUCED CHARGES.—The Metropolitan Electric Supply Co., Ltd., has decided to reduce the lighting flat rate charge from 5d. to 4½d. per kWh.

Australia.—LAUNCESTON (TAS).—The net profit of the electricity supply undertaking for the year ended June 30th last was £4,278, and the total capital now spent on the undertaking is £351,538. The maximum demand for the year was 5,323 kW.

Birkenhead.—ASSISTED WIRING.—The Electricity Committee is to apply for sanction to a loan of £25,000 for the assisted wiring scheme.

Bo'ness.—VOLTAGE VARIATION REMEDIES.—The Town Council has agreed to appoint a consulting engineer to confer on the proposal of the Electricity Committee to lay new feeder cables in parts of the town where the voltage is below standard. The scheme favoured by the Committee is estimated to cost £3,853.

Brierfield.—PRICE REDUCTIONS.—Recent reductions in charges for electricity at Brierfield include the following:—Lighting: First 25 kWh, 5½d. per kWh; next 50 kWh, 5½d.; next 100 kWh, 5d.; beyond, 4½d. Commercial: First 250 kWh, 2½d. per kWh (a reduction of ½d.).

Burnley.—MAINS EXTENSIONS.—The Electricity Committee proposes to extend mains to the Lower Red Lees Estate, at an estimated cost of £290, and along Casterton Avenue at an estimated cost of £275.

Burton-on-Trent.—LOANS.—The Electricity Committee is applying for sanction to loans of £20,000 for mains and £5,000 for transformers.

Bury St. Edmund's.—STANDBY PLANT.—The Town Council has decided, in the case of consumers having a private generating plant and connected for supply only in the event of a breakdown, to make an annual charge of £2 per kW for existing connections, and £5 for future connections on a five years' agreement.

NEW ROTARY CONVERTOR.—With the approval of the Electricity Commissioners, a 500-kW rotary convertor is to be installed provided that the three largest consumers are not changed over within at least three years.

RADIO AND THE CHANGE-OVER.—Consumers having mains radio receivers are to be allowed a cash equivalent, to be estimated by the engineer, as an alternative to the conversion of their existing sets on the change-over.

DECORATIVE LIGHTING.—For the summer quarter a special charge of £2 5s. per kW per quarter, plus 1d. kWh, is to be made for outside decorative lighting.

Canada.—HYDRO-ELECTRIC PROGRESS.—About 98 per cent. of the output of central electric stations in Canada, according to the Dominion Water Power and Hydrometric Bureau, is generated by hydraulic installations. The proportion of hydraulic installation available for public use is steadily growing to keep pace with the increasing demand for domestic, commercial and industrial energy. In all three of these fields new adaptations are increasing the demand. The development of mains radio receivers, electric refrigerators, therapeutic appliances, and general household devices in the domestic field; of improved commercial lighting and advertising in the commercial field; and of electro-chemical and electro-metallurgical processes in industry constantly increases the demand on the central electric stations. At the present time there are 328 hydro-electric central stations in Canada with a total installation of 5,734,491 h.p. Of these totals 226 stations, with a capacity of 4,241,838 h.p., are owned by commercial organisations, while municipal or other public organisations operate 102 stations, aggregating 1,492,653 h.p. The average installation of the commercial stations is 18,769 h.p. and the average capacity of their turbines 6,965 h.p., as compared with 14,634 h.p. and 6,168 h.p. respectively for the municipal stations.

Canterbury.—ASSISTED WIRING.—The City Council has decided to adopt an assisted wiring scheme. Consumers will pay 6½d. per kWh (2d. per unit more than the ordinary charge) until they have used 160 kWh per £1 of capital expenditure. The work will be undertaken by contractors.

Chichester.—REDUCED BULK SUPPLY CHARGES.—Portsmouth Town Council has amended its terms for a bulk supply to Chichester. After four million kWh per annum the price is to be 0.3d. per kWh, based on coal at 16s. per ton, the kW charge being reduced from £4 to £3 17s. 6d. per annum.

China.—NEW POWER STATION.—The Chinese Ministry of Industry recently authorised the construction of a 40,000-kW hydro-electric power station at Ichang as part of the five-year industrial plan for the development of the Yangtze Valley.

Continental.—FRANCE.—The Société Hydro-electrique Valentinoise has secured a concession to establish an electric power distribution system in the Departments of Haut-Garonne and Tarn-et-Garonne.

AUSTRIA.—Preparations are being made for the construction of a power station at Persenberg. The station is to utilise the water of the Danube, and when completed will be capable of generating 800 million kWh per annum.

Dumfriesshire.—EXTENSIONS.—For the purpose of the distribution of electricity within the original Gretna and Dornoch

area of supply, the County Council has sanctioned capital works incidental to the provision of additional cables and overhead lines at a cost of £1,133, and the installation of a sub-station at Gretna and the provision of a new transformer and switchgear in the sub-station at Eastriggs, at a cost of £354.

Dewsbury.—Electricity for Earlsheaton Area.—The Electricity Committee proposes to lay cables to provide electricity in the Earlsheaton area.

Dorchester.—Mains and Services.—The Electricity Committee is to apply for sanction to a loan of £1,000 for mains and services.

Ealing.—Mains Extensions.—The Electricity Committee is to extend mains to supply the Oaklands Estate.

Exe Valley.—Special Order Amendment.—The Exe Valley Electricity Co., Ltd., has applied to the Electricity Commissioners to amend the draft of the Exe Valley Electricity Extension Order so as to include in the area of supply the parishes of Beaford, Buckland Filleigh, High Bickington, Huish, Langtree, Little Torrington, Merton, Peter's Marland, Petrockston, Roborough, Shebbear, Sheepwash and St. Giles-in-the-Wood.

Hoylake.—Extensions.—The Urban District Council is to apply for sanction to a loan of £10,000 for mains extensions.

Hull.—Allocation of Contractors' Work.—At a recent meeting of the Electricity Committee, the engineer reported that the time was now opportune for the whole of the work given out by the Department under its assisted wiring and cooker hiring schemes to be distributed evenly among the whole of the contractors now on the roll with the exception of those placed on the roll during the current financial year. The pro rata allocation had now been working for a sufficient time to compensate all contractors for the additional work put in at the commencement of the scheme.

Ilfracombe.—Council to Purchase Undertaking?—No reply having been received from the Ilfracombe Electric Light and Power Co., Ltd., to a request for a lower flat rate tariff, the question of whether the Urban District Council shall exercise its right to purchase the undertaking is to be referred to a committee of the whole Council.

India.—The Mandi Hydro-Electric Scheme.—Rapid progress is being made with the hydro-electric scheme for supplying power from headworks in the Himalaya to 47 towns in the Punjab and Mandi, *The Times* states. For several years the use of electricity for thermal stations has been increasing at the rate of 10 per cent. per annum. The Punjab Government has formed a special fund to assist the owners of mills and factories to convert them for electrical driving. The new supply will be used also largely for agricultural purposes, including the irrigation of 2¼ million acres of high-level land, the threshing and cleaning of wheat, the ginning and cleaning of cotton, and the manufacture of fertilisers. One of the most important projects in connection with the scheme—the construction of a one and a quarter mile long tunnel to convey pipe lines—was completed last month, workmen having been engaged on this project for nearly four years. The tunnel, which is on various levels, is not in a straight line, and has been driven through it from each end. It is nine feet in diameter and two and two-thirds miles long.

Langport.—Public Lighting.—The Parish Council has decided to substitute electricity for gas public lighting in all parts of the town, including the Garden City, and has accepted the tender of the North Somerset Electric Supply Co., Ltd.

Lerwick (Shetland).—A Supply in August.—It is expected that a supply of electricity will be available for private consumers in August.

London.—The L.J.E.A.'s Acquisitions.—Replying to a question by Mr. Herbert Williams, Mr. Pybus, the Minister of Transport, stated in the House of Commons last week that he was aware that the London and Home Counties Joint Electricity Authority had recently made a further issue of stock to the extent of £1,500,000, and he was informed that the Authority had purchased the electricity undertakings mentioned below :—

Name of Undertaking.	Date of Acquisition.	Amount of Purchase Price.
		£
Dorking and District undertaking (Edmundson's Electricity Corpn., Ltd.)	Jan. 1st, 1931	69,496
Leatherhead and District undertaking (Leatherhead and District Electricity Co., Ltd.) ..	Jan. 1st, 1931	312,540
Surbiton and District undertaking (Callender's Cable & Construction Co., Ltd.)	Jan. 1st, 1931	198,216
Twickenham and District undertaking (Twickenham and Teddington Electric Supply Co., Ltd.)—		
Middlesex part of undertaking	Jan. 1st, 1931	479,321
Surrey part of undertaking	July 24th, 1931	143,488
Weybridge undertaking (Urban Electric Supply Co., Ltd.)	July 24th, 1931	74,807
	Total ..	1,277,868

The Joint Authority had entered into an agreement with the South Metropolitan Electric Tramways and Lighting Co., Ltd., for the purchase of the company's electricity undertaking. The transfer would be effected as from July 1st, 1932, the total purchase money being £826,500, bringing the total cost of purchased undertakings to £2,104,368. The accounts of the Joint Authority for the year just closed had not yet been published, but as the above payments represented expenditure out of capital raised by the Joint Authority, it was presumed that the values of the purchased undertakings would appear in the accounts at the above mentioned figures. The approximate asset values of the various undertakings were :—

Dorking, £69,500; Leatherhead, £294,000; Surbiton, £194,000; Twickenham, Middlesex part, £473,000; Twickenham, Surrey part, £105,500; Weybridge, £55,500; South Metropolitan, £728,000; total, £1,919,500.

Fulham.—The Electricity Committee is to lay supplementary cables at a cost of £7,712, provide new feeders between Barclay Road sub-station to the power station at a cost of £3,725, and lay a feeder to Hurlingham sub-station at a cost of £1,140.

Islington.—The Electricity Committee is applying for sanction to a loan of £5,000 in order to continue without interruption the work of replacing rubber-insulated mains.

Stoke Newington.—The Borough Council has received sanction to a loan of £2,000 for cookers for hire and is to apply for permission to borrow a further £2,000 for the same purpose.

Mexico.—Importation of Electricity.—A Government order, says *Reuter's Trade Service* from Mexico City, authorises the concessionaires of electric power to import electricity for consumption up to an annual total of 75,000,000 kWh, the Government thus hoping to promote the use of electricity for agricultural and industrial purposes in certain border districts.

Newport (Mon).—Supply in Magor Area.—The borough electrical engineer has been instructed to proceed with the construction of overhead lines to supply the Magor area.

Ripon.—Lighting Charges in Rural Areas.—The Electricity Committee has fixed the lighting charge in the rural areas at 8d. per kWh with a minimum quarterly charge of 10s. in the winter and 6s. 8d. in the summer.

Romford.—Overhead Lines Inquiry.—A Ministry of Transport inquiry was held on April 12th into the application of the County of London Electric Supply Co., Ltd., for sanction to erect overhead lines to supply electricity to houses in Forest Road and Grange Road. It was stated that the cost of an overhead line would be £194, against £282 for underground cables, and that the former was desired because of the few houses to be supplied. The clerk to the Urban District Council opposed the application on the ground that overhead wires would destroy the amenities of the district.

South Africa.—Johannesburg.—The City Council has received sanction from the Executive Committee of the Transvaal Provincial Council to a loan of £100,000 for power station extensions.

South Cumberland.—Reduced Cooking Charges.—The South Cumberland Electricity Co., Ltd., has reduced its charge for electricity for cooking under the rateable value tariff from 1½d. to 1d. per kWh.

Spalding.—Extensions.—The Urban District Council has applied for sanction to a loan of £1,000 for the extension of the electricity supply to the Weston boosting station of the East Elloe Joint Water Supply Board.

Stafford.—Year's Working.—We have received from Mr. W. H. Robins, borough electrical engineer, his accounts for the year ended March 31st, 1931. The total revenue amounted to £53,553, while the working expenses were £39,406, leaving a net profit of £3,749. In the previous year the revenue was £53,570, the working expenses £23,509, and the net profit £2,395. During the year 8,957,917 kWh was sold, as compared with 8,599,814 kWh in 1929-30. The cost per kWh decreased from 1.43d. to 1.33d. and the income per kWh from 1.49d. to 1.43d. The maximum demand rose from 4,267 to 4,529 kW.

Tonbridge.—Fringe Order.—The Urban District Council has consented to the Town Council obtaining a Fringe Order to supply electricity to Five Oak Green.

Ulverston.—Modification of Charges.—The Urban District Council has agreed to a modification in the charges for the supply of electricity in order to make the rate uniform with those charged in the rural district and by the Barrow-in-Furness Town Council. The day rate will now be as follows: From three-quarters of an hour after sunset until 9 p.m., 7d. per kWh. From 9 p.m. until the hour or part of an hour preceding the former period, first 2,500 kWh per quarter, 1½d. per kWh; next 10,000 kWh, 1¼d.; beyond, 1d. The previous rates were: From one hour after sunset until midnight, 6d. per kWh. Midnight until one hour after sunset, first 12,500 kWh, 1¾d.; next 25,000 kWh, 1¼d.

United States.—The Muscle Shoals Bill.—The *Electrical World* states that provisions written into the Muscle Shoals Bill by the House Committee conflict so much with the sentiments of the sponsors of the Senate measure that the final passage of legislation on the subject is doubtful this session. In its report the House Committee takes the position that the door should not be closed to any prospective lessee even though the time limit fixed for the negotiation of a lease may have expired. Thus, if the Muscle Shoals Commission fails to obtain a satisfactory lease within eighteen months, government operation would be authorised until such time as a lease could be obtained. Senator Norris, on the other hand, is unalterably opposed to any legislation that would make government opera-

tion conditional. Senator Norris also is opposed to any Muscle Shoals legislation that does not provide for the construction of government transmission lines in the event of a lease not being obtained. The House Bill makes no such provisions. Unless there are publicly owned transmission lines, Senator Norris does not believe that the government would be able to distribute the surplus power at rates that would be sufficiently low. A minority of the House Committee has found itself unable to support the measure that has been recommended, and has entered a separate report opposing any plan for government operation.

Walsall.—NEW CHARGES.—A special tariff has been drawn up by the Electricity Committee with a view to extending the bulk supply system to large consumers who are not in a position to install 30 h.p. of motors.

SUPPLY TO GREAT BARR AND BENTLEY.—The Corporation has decided to apply for a Special Order to supply electricity in the parishes of Great Barr and Bentley.

Warrington.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to a loan of £20,000 for mains and services.

Watford.—SUPPLY TO PICCOTTS END.—Sanction has been received by the Town Council to a loan of £1,350 for laying mains to supply Piccotts End, Hemel Hempstead.

West Hartlepool.—NEW CABLE.—To strengthen the supply in the area west of Wooler Road the Town Council is to lay an additional cable from the Mulgrave Road sub-station at an estimated cost of £2,250.

Winchester.—FUTURE OF ELECTRICITY UNDERTAKING.—In view of the introduction of the grid system the Electricity Committee has asked Mr. May, of Messrs. May and Hawes, to report on all aspects of the undertaking and to make recommendations regarding its future policy.

Workington.—MAINS EXTENSIONS.—Mains extensions are to be carried out in Northumberland Street at a cost of £330.

Traction

Continental.—RUSSIA.—The *Manchester Guardian Commercial* states that the Russian Government is to spend £1,500,000 on trolley vehicle services in Magnitogorsk, Dzerzhinsk and Novo Siberisk.

HUNGARY.—Work is in progress for the electrification of the section of the Hungarian State Railway between Budapest, Ostb, and Hegyeshalom on the Austrian frontier. The distance between the terminal points is about 112 miles, but altogether 325 miles of track are being electrified on the 16-kV single-phase 50-cycle system. Power will be received at 100 kV and stepped down at four 4,000-kVA transformer stations.

FRANCE.—An experiment in centralised traffic control was carried out in Paris recently. The object of the system, which is a replica on a much reduced scale of that used in New York, is to enable all the traffic to advance and stop together instead of obeying a series of independent signals as at present. The *Morning Post* says that it is calculated that the time thus saved at a big crossing may be as much as twenty seconds. The signals are automatic, and if successful will be introduced generally.

ROUMANIA.—The *Manchester Guardian Commercial* reports that the Roumanian State Railways are to spend £1,300,000 on electrification works in the Brasov-Campina district. The programme includes rolling stock and electrical equipment.

Japan.—RAILWAY ELECTRIFICATION.—Investigations into railway electrification in Japan show that of the 14,832 km. of State Railway only 2.4 per cent. is electrified. There are 7,108 km. of local railways, and of this 53 per cent. is electrified. Out of 2,695 km. of tramways, 2,075 km. is electrified, chiefly at 600 V. Most of the State Railway operates at 1,500 V, while just over half of the local railways are run at 1,500 V, the remainder employing 1,200 and 600 V.

A message from Yokohama states that the Shima Electric Railway in Miye Prefecture is to be extended from Toba to Futami at a cost of 600,000 yen (about £62,500 at par).

Liverpool.—TRAMWAY WAGES.—Following negotiations with the Tramways Committee the tramway and bus drivers, conductors and shed workers have agreed to a reduction of 1s. a week and a slight alteration in working conditions.

North Shields.—AUTOMATIC TRAFFIC CONTROL.—Work has commenced on the erection of automatic traffic signals at North Shields for the Tynemouth Town Council.

Southern Railway.—COLOUR LIGHT SIGNALLING.—Colour light signalling is to be used on the Southern Railway's London-Brighton line now in course of electrification and tests are now taking place on the first section of the route between Coulsdon and Three Bridges which is due to be completed in July next.

Communications

Australia.—TELEPHONES IN USE.—According to the report of the Australian Postmaster-General for the year ended June 30th, 1931, business depression prevented the extension of the telephone service, and for the first time the number of cancellations exceeded that of new connections. Since then, however, there have been signs of improvement. Mr. H. P. Brown, the Postmaster-General, states that the net decrease for the six months ended June last was 14,178, but for the half-year ended December last the figure was 10,205. In January the decrease was 833, compared with an average of 1,700 a month for the previous six months. For the current half-year the decrease is estimated at 4,000, and the indications are, says Mr. Brown, that in the near future a progressive recovery may be expected.

RADIO-TELEPHONY.—The Postmaster-General announces that the radio-telephone service which is available to all parts of Victoria, New South Wales, Queensland, and South Australia, has now been extended to Perth, Western Australia.

France.—POLICE RADIO.—A police wireless station has been installed at Le Havre in the new headquarters of the Police Brigade specially attached to the Port. The receiving station is already in action, and the transmitting station will be ready at the end of the month. In this way the police will be able to keep in constant touch with shipping.—*Reuter* (Paris).

Germany.—RADIO LICENCES.—During the first three months of this year nearly 200,000 new licences were taken out, bringing the total number of subscribers in the country to 4,168,440 on April 1st this year. Of this total, 356,837 were unemployed, blind, or disabled ex-Service men, all of whom are exempt from payment of the annual wireless licence fee of 24 marks (£1 4s. at par).—*Reuter* (Berlin).

Great Britain.—RADIO EXCHANGES.—The Radio Manufacturers' Association has requested the Bromley (Kent) Town Council to defer any decision upon the applications received for the establishment of radio relay services until the local wireless dealers have had an opportunity of presenting their objections.

Audenshaw Urban Council has received an application from the Suburban Radio Relay Co., Ltd., of Blackburn, for permission to establish a service in the town.

Dorchester Town Council has decided to enter into an agreement with Broadcast Listeners' Service, Ltd., for the establishment of a relay service.

The Newcastle-upon-Tyne City Council has reached an agreement with the Northern Wireless Relay Co., Ltd., regarding the erection of wires over highways.

The Ripon Highways Committee has arranged for the provision of relay services in the city to be considered by a small sub-committee jointly with a similar sub-committee appointed by the Electricity Committee.

RADIO LICENCES.—At the end of March last the number of broadcast radio receiving licences in use totalled 4,624,153, an increase of 67,413 during the month and of 976,663 compared with a year previously.

India.—CARRIER TELEPHONY.—Our Indian Correspondent reports that telephony between Calcutta and Bombay will be greatly improved by the completion of the installation of the new high-frequency carrier system which is shortly due. Hitherto, telephone connection was through a circuitous line, *via* Delhi and Agra, but now there will be direct communication with a capacity of 1,200 words per minute. Provision is being made for four telegraph channels in each direction in addition to an ordinary telephone circuit on the same pair of wires. The full capacity is ten channels. Between Bombay and Calcutta, repeater stations have been installed at Bhusaval,

Most of the Government Departments were switched over on April 14th from "Victoria" to the new "Whitehall" exchange illustrated above

Nagpur, Raipur, and Jharsuguda. Some apparatus is said to be still required to complete the fittings in the intermediate offices, after which the telephone circuit will be ready for public service at an early date.

Cable-Wireless Merger.—The merger between the Indian Radio Telegraph Co. and Imperial and International Communications, Ltd., came into operation on April 1st, and a purely Indian company has taken over the working of the cable service, owned and conducted by the British company. The new concern is to be known as Indian Radio and Cable Communications, Ltd., with a board of directors in Bombay, consisting of representatives of each company and the Government. The merger will result in considerable benefit to the public by a reduction in rates charged for foreign messages. Tenure of service has been guaranteed to the covenanted staff of the Eastern Telegraph Co., both in Bombay and Madras.

Latvia.—Telephone System.—The public telephone service is a State monopoly controlled by the Post, Telegraph and Telephone Department of the Ministry of Communications. According to the last report, on April 1st, 1931, the system comprised 11,042 miles of local lines and 8,235 miles of long-distance lines. The number of exchanges in the country increased from 836 to 904, subscribers from 40,996 to 49,237, and public telephone kiosks from 1,193 to 1,293. Most of the exchanges are manually operated. Only the city of Riga and twelve very small localities in the country districts have automatic stations. Formerly the equipment was a combination of German, Swedish, and Russian makes. The first automatic exchange in Latvia was built in 1927 in Riga by a German company. The Post and Telegraph Department purchased the right from that company to build locally complete telephone-exchange systems and telephone apparatus to the German company's designs. Since that time the workshops of the Department have built small exchanges for the smaller provincial centres and has constructed apparatus and accessories. The workshops of the Department have now been developed to a point which makes the importation of telephone equipment from abroad unnecessary. The only field left open to foreign manufacturers is copper wire, cable measuring instruments and special tools occasionally purchased by the Department, but owing to Budget curtailments for this and next year, extensions and purchase of equipment have been postponed.

Shanghai.—Telephone Conversion Completed.—Although the Shanghai Telephone Company's contracts for the conversion of the Shanghai telephones to automatic operation provided for completion in two years, the entire work has been completed in less than twenty months, according to a report from Mr. Frank Gill, vice-president of the Shanghai Telephone Company. In view of the extraordinary demands for service and the difficulties of working under the handicaps caused by the fighting between the Chinese and Japanese armies, the completion of this programme four months ahead of schedule is an outstanding achievement, especially as one of the exchanges was actually cut over in the middle of February, when the fighting was at its height.

Switzerland.—New Regional Radio Station.—The Swiss Telegraph Administration has placed an order with Marconi's Wireless Telegraph Co., Ltd., for a 15-kW broadcast transmitter, to be erected at Monte Ceneri in Tessin. This station is intended to be the "regional" station for Italian-speaking Switzerland, and when working it will complete the regional broadcasting system planned by the Swiss Telegraph Administration, providing for broadcast stations in the German, French, and Italian speaking parts of the country. The transmitter for Monte Ceneri will be of the Marconi P.A.19A type, with an unmodulated aerial energy of 15 kW and allowing for sensibly distortionless modulation up to 80 per cent. It will be adjustable to any wavelength between 400 and 800 metres, and the provisional working wavelength has been fixed at 760 metres. The aerial at Monte Ceneri will be of the "T" type, suspended between two insulated self-supporting masts each 125 metres in height. The down lead of the aerial will lead straight into the transmitting hall. The new station is expected to be in operation this year.

Venezuela.—Radio Communications.—New regulations for broadcasting in Venezuela have been issued by the Government of Venezuela. The provisions forbid concessionaires to obstruct messages from other countries; programmes must be mainly artistic and cultural, any commercial propaganda being used sparingly; persons carrying on business in receiving sets are to notify monthly the number of sets sold, rented or transferred, with the mark, factory number and address of owners of the sets. Owners must themselves notify the name of the concern originally selling the set and the number of the apparatus. Receiving licences will continue to cost 5 bolívars a month, the proceeds going to support broadcasting. Over 2,500 receiving sets, it is estimated, are already installed; British sets are becoming increasingly popular, although meeting with keen competition from United States and Dutch manufacturers. A.c. receivers are preferred to battery types. Central station service at Caracas is 190-V, 25 and 50-cycle a.c., but elsewhere 110-V, 60-cycle a.c. is general.—*Reuter's Trade Service* (Caracas).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberhill (Fife).—April 26th. County Council. Various works, including heating and electric lighting, in connection with Aberhill school additions. Mr. G. Sandilands, architect and master of works, Education Offices, Kirkcaldy (deposit £1 1s.).

Auchtermuchty (Fife).—April 25th. Town Council. Electric lighting for housing scheme. Messrs. James Gillespie & Scott, architects, St. Andrews.

Australia.—Melbourne.—May 10th. Posts and Telegraphs Department. Switches. (A.X. 11333.)*
May 31st. Electrical testing apparatus. (A.X. 11332.)*

Belgium.—Ixelles.—May 2nd. Hotel Communale. 1,300 d.c. electricity meters. Particulars (Cahier des Charges) from Le Service de l'Electricité, 20, Rue d'Alsace-Lorraine, Ixelles.

Cheadle and Gatley.—May 10th. Electricity Department. 6,600-V truck type control cubicle and a medium pressure stationary type ironclad unit. (See this issue.)

Dagenham.—Urban District Council. Cables, switchgear, overhead conductors, &c. (April 15th.)

Dalkeith.—April 28th. Town Council. Electrical work in 140 houses. Mr. J. L. McDougal, burgh surveyor, Municipal Buildings.

Dumfries.—May 7th. County Council. 11,000-V truck type switchboard for Gretna sub-station. (See this issue.)

Dundee.—April 29th. Transport Department. General stores (annual contract), including armature and field coils, &c. Mr. R. Taylor, general manager.

Farnworth.—April 29th. Electricity Department. L.p. cables. (April 15th.)

Galloway.—May 2nd. Galloway Water Power Co. Hydraulically operated valves, &c. (April 8th.)

Glasgow.—April 23rd. Lighting Department. Twelve months' supply of electrical fittings and accessories. Specs. from 20, Trongate.

Halifax.—May 2nd. Town Council. Electricians' work at 18 houses, Holmfield, and 16 houses and 16 bungalows, Shibden. Mr. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Hastings.—May 11th. Electricity Department. Boiler fuel. (April 15th.)

Horsham.—May 9th. Electricity Department. Cables. (April 15th.)

Inverness.—April 26th. Electric lighting installation at new nurses' home and sanatorium to be erected at the Inverness District Asylum. Messrs. Alexander Ross & Son, architects, Queensgate Chambers, Inverness (deposit £1 1s.).

London.—Central Electricity Board.—May 2nd. 33-kV and other cables for the South-West England and South Wales Scheme. (April 8th.)
Office of Works.—April 25th. Lamps. (April 15th.)

Manchester.—April 27th. Electricity Department. Cables, electrical equipment, and domestic appliances. (April 15th.)

Middlesbrough.—May 12th. Electricity Department. Cables and meters. (See this issue.)

Midlothian.—May 6th. County Council. Electrical works in connection with three housing schemes (104 houses). County architect, 9, Drumsheugh Gardens, Edinburgh.

New Zealand.—Wellington.—June 7th. Post and Telegraph Department. Magneto bells. (A. 11331.)*

North-West Midlands.—April 25th. Joint Electricity Authority. E.h.p. and l.p. overhead transmission lines and outdoor type static transformers. (April 15th.)

Salford.—April 25th. Electricity Department, 12,500-kVA outdoor type transformer. (April 8th.)

Skipton.—April 25th. West Riding Education Committee. Electric lighting installation at Boys' Grammar School. Education officer, County Hall, Wakefield.

South Africa.—Durban.—May 16th. Electricity Supply Commission. 175-kVA transformer (A.X. 11313)* and turbo-generator with condensing plant (A.X. 11318)* for the Congella power station.
Pietermaritzburg.—May 19th. City Council. Meters (A.X. 11314)*, house service fuse boxes (A.X. 11315)*, insulated cable (A.X. 11316)*, lamps (A.X. 11317)*, and hard-drawn copper wire and insulated wire (A.X. 11319).*
Capetown.—June 22nd. Electricity Department. Voltage regulators. (A.X. 11328.)*
May 18th. Overhead line material and street lighting fittings. (G.X. 11372.)*
Johannesburg.—May 26th. City Council. Transformers (A.X. 11329) and traction lamps (A.X. 11330).*

West Hartlepool.—May 3rd. Electricity Department. Cables. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Watch Committee. Recommended. Installation of automatic traffic signals (£113).—Barber & Colman, Ltd.

Carlisle.—Electricity Committee. Accepted. Switchgear for the Westlinton and Gilsland sub-stations.—Ferguson, Pailin, Ltd.

Clacton-on-Sea.—Urban District Council. Accepted. 31 lighting units for the Pier Avenue and Station Road lighting scheme.—Revo Electric Co., Ltd. Kiosks (£301).—English Electric Co., Ltd. E.h.p. and l.p. cable (£1,068).—Derby Cable Co. Ltd. Overhead network (£1,064).—W. T. Henley's Telegraph Works Co., Ltd. Switches (£244).—Crompton Parkinson, Ltd.

Colchester.—City Council. Accepted. Electric lighting installation at the maternity home.—Joslins (Colchester), Ltd.

Dewsbury.—Electricity Committee. Accepted. E.h.p. cables.—Macintosh Cable Co., Ltd. L.p. distribution board (£87).—Parmiter, Hope & Sugden, Ltd.

Gillingham (KENT).—Town Council. Accepted. Electric crane.—Stothert & Pitt, Ltd.

Glasgow.—Housing Committee. Recommended. Electrical installations at Garngad rehousing scheme (£557).—R. J. Sinclair (Glasgow), Ltd.

Transport Committee. Accepted. Switchgear at Knightswood garage.—Crompton Parkinson, Ltd. Transformers for Knightswood and Pinkston.—English Electric Co., Ltd. Transformer cores for Coplawhill sub-station.—British Thomson Houston Co., Ltd. Distribution boards for Knightswood.—Siemens Electric Lamps & Supplies, Ltd. Side frames for trucks.—Brush Electrical Engineering Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during March :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Motor alternators.—Haslam & Newton, Ltd.
Electric cable.—Hoopers Telegraph & India Rubber Works, Ltd.
Condensers.—Dubilier Condenser Co.; Telegraph Condenser Co.
Electric cranes.—Thos. Smith & Sons (20-ton); Herbert Morris (5-ton); Joseph Booth & Bros. (10-ton); Stothert & Pitt; Sir W. Arrol & Co. (two 3-ton).
Electric lamps.—G.E.C.; B.T.-H.; Siemens Electric Lamps & Supplies; Ediswan Co.
Motor-driven hydraulic pump.—Greenwood & Batley.
Automatic starters, &c.—Watford Electric Mfg. Co.
Switchboard.—Crompton Parkinson.
Main supply switchgear.—Whipp & Bourne.

WAR OFFICE.

W/t. valves.—G.E.C.

AIR MINISTRY.

Receivers and amplifiers.—Oliver Pell Control.
Transmitters.—Gambrell Bros.

CROWN AGENTS FOR THE COLONIES.

Cables.—Henley's; Standard Telephones & Cables.
Generator.—Electric Construction Co.
Lighting Arrestors.—International G.E.C. of N.Y.
Static transformers.—Johnson & Phillips.
Surge absorbers.—Ferranti.
Wire.—G.E.C.

POST OFFICE.

Telephonic apparatus.—Automatic Elec. Co.; Ericsson Telephones; G.E.C.; Joseph Sankey; Siemens Bros.; Standard Telephones & Cables.
Wireless apparatus.—Walters Electrical Mfg. Co.
Tungar bulbs.—Ediswan Co.
Cable.—Connollys (Blackley); Henley's.
Loading coils.—G.E.C.
Telephone cords.—Phœnix Telephone & Electric Works; Siemens Bros.; Standard Telephones & Cables.
Dynamotors.—Dynamo & Motor Repairs.
Impulsing machines.—Standard Telephones & Cables.
Steel reflectors.—Veritys.
Secondary cell separators.—C. A. Vandervell.
Electrically recording time stamps.—Blick Time Recorders.
Tumbler switches.—G.E.C.
Wallboards.—Siemens Bros.; H. J. Townsend & Son.
Copper wire.—E. & E. Kaye; Shropshire Iron Co.; F. Smith & Co.; Whitecross Co.
Flameproof wire.—Reliance Electrical Wire Co.
Telephone exchange equipment.—Chatham, Maida Vale (London), Prudential Assurance Co., London, Belgrave (Leicester).—Siemens Bros. & Co. Sub-contractors for Belgrave: Chloride Electrical Storage Co. for batteries; Crompton Parkinson for charging and ringing machines. Leeds trunk telephone exchange.—Siemens Bros. Sub-contractors: Chloride Electrical Storage Co. for batteries; Crompton Parkinson for charging and ringing machines. Temple Bar (London), London trunk telephone exchange, Leeds trunk telephone exchange, Bristol trunk exchange.—Standard Telephones & Cables. Purley, Oakwood (Leeds), Holborn (London), Metropolitan (London), Birmingham trunk exchange.—Automatic Electric Co. Sub-contractors for Birmingham: Alton Battery Co. for batteries; Electric Construction Co. for ringing machines. Gladstone (London), Birchfields (Birmingham).—Ericsson Telephones. Sub-contractors for Birchfields: Pritchett & Gold and E.P.S. Co. for batteries; Electric Construction Co. for charging and ringing machines. Swinton (Manchester).—Ericsson Telephones. Sub-contractors: Pritchett & Gold and E.P.S. Co. for batteries; Electric Construction Co. for charging machine. Hither Green (London).—G.E.C.
Telephonic repeater equipment.—Gloucester: G.E.C. Swansea: Standard Telephones & Cables. Sub-contractors for Swansea: Chloride Electrical Storage Co. for batteries; Electric Construction Co. for charging machines; Haslam & Newton for ringing machines.
Voice frequency telegraph apparatus, Dundee P.O. and G.P.O. (West), E.C.—Standard Telephones and Cables.

Great Yarmouth.—Town Council. Accepted. Meters.—Ferranti, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Edison Swan Elec. Co., Ltd. Cable (£142).—Derby Cables, Ltd. Transformer kiosk (£82).—Metropolitan-Vickers Electrical Co., Ltd.

Hull.—Telephones Committee. Recommended. Cable (£459).—W. T. Henley's Telegraph Works Co., Ltd.
Electricity Committee. Recommended. Transformers.—Metropolitan Vickers Electrical Co., Ltd. (6,600 and 11,000 V.). Yorkshire Electric Transformer Co., Ltd. (22,000 V.). Wall brackets (£51 each).—Revo Electric Co., Ltd. Time switches.—Horstmann Gear Co., Ltd.
Hospital Committee. Accepted. Electric lighting at mental hospital nurses' home (£555).—Booker & Tarran.
Property Committee. Accepted. Main switchboard for Guildhall (£162).—Bertram Thomas.

Leeds.—Electricity Committee. Accepted. Supply of meters for 12 months.—Measurement, Ltd.

London.—LEWISHAM.—Borough Council. Accepted. Internal telephones for the Town Hall extension (£100).—Drake and Gorham, Ltd.
SHOREDITCH.—Electricity Committee. Recommended. Turbine-driven centrifugal feed pump (£485).—G. & J. Weir, Ltd. Cables (£2,014).—Hackbridge Cable Co., Ltd.
ST. MARYLEBONE.—Electric Supply Committee. Recommended. Cable for year ending March 31st, 1933.—British Insulated Cables, Ltd., Enfield Cable Works, Ltd.
STOKE NEWINGTON.—Electricity Committee. Recommended. Installation work (£5,721).—H. Ferguson & Co.
FULHAM.—Electricity Committee. Recommended. Switchgear (£503).—Metropolitan-Vickers Electrical Co., Ltd.

Macclesfield.—Rural District Council. Accepted. Installation of electric lighting in 24 houses at Rainow (£129).—R. Brees.

Manchester.—Corporation Transport Committee. Accepted. General stores during the year ending March 31st, 1933 :—Assembled commutator segments; armature coils.—Manchester Armature Repair Co., Ltd. Armature coils.—British Thomson-Houston Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd. Insulated blocks for B.W. 220 motor brush holders; mica segments for commutator; shoes for electro-mechanical brake.—Metropolitan-Vickers Electrical Co., Ltd. Motor brush-holder spare parts, locknuts and clamp rings.—Estler Bros., Ltd. Cable.—Hackbridge Cable Co., Ltd.; W. T. Glover & Co., Ltd. Steel wire.—British Ropes, Ltd. Galvanised mild-steel wire cable.—R. Johnson & Nephew, Ltd. Switches, magnet coils and cores and hammers with springs for electric bells, backs for inside car and canopy bell presses.—General Electric Co., Ltd. Fuses.—O'Brien & Hulme. Switches and lampholders.—Falk, Stadelmann & Co., Ltd. Switches and cells.—Siemens Bros. and Co., Ltd. Lampholders.—V. H. Iddon, Ltd. Lampholders, plug adaptors, soldering fluid and bell and flexible wire.—Ward & Goldstone. Gongs for electric bells and bell presses.—Edison Swan Electric Co., Ltd. Binding posts with contact screws and terminals and screws for electric bells.—Davis and Timmins, Ltd.

St. Helen's.—Town Council. Accepted. Cables.—British Insulated Cables, Ltd.

Swansea.—Education Committee. Accepted. Electrical installation at Baptist Wells school (£249).—Magneto Repair & Winding Co., Ltd.

Torquay.—Beaches Committee. Accepted. Rewiring café (£139).—C. Buswell & Sons.

Forthcoming Events

Birmingham Electric Club.—Friday, April 22nd. Grand Hotel, Birmingham. 7 p.m. "The Problem of Electricity Supply in Thinly Populated Areas." Mr. W. Burton.

Junior Institution of Engineers.—Friday, April 22nd. Hotel Metropole, S.W. Annual dinner.

Illuminating Engineering Society.—Tuesday, April 26th. Royal Society of Arts, W.C. 7 p.m. "Progress in Decorative Lighting." Mr. E. H. Penwarden.

Diesel Engine Users' Association.—Thursday, April 28th. Caxton Hall, Westminster, S.W. 3.30 p.m. "Cylinder Liner Wear." Eng. Rear-Admiral J. Hope Harrison.

Institution of Electrical Engineers.—Thursday, April 28th. Institution, London. 6 p.m. Joint meeting with the Institute of Transport. "The Electrification of the Suburban and certain Main Line Sections of the Great Indian Peninsula Railway." Mr. F. Lydall. (*Irish Centre (Dublin)*).—Saturday, April 23rd. Faraday lecture. "Everyday Uses of Electricity." Prof. J. K. Catterson-Smith. (*Western Centre*).—Monday, April 25th. Maynard's Restaurant, Taunton. 5 p.m. Informal meeting. Discussion on Cooking by Electricity. (*London Students' Section*).—Tuesday, April 26th. Institution, London. 6.15 p.m. Joint meeting with the Royal Aeronautical Society Students. "Radio Communication in Aviation." Mr. A. D. Hodgson. Wednesday, April 27th. 3 p.m. Visit to Waygood-Otis, Ltd., Falmouth Road, S.E. (*Meter and Instrument Section*).—Friday, April 29th. Institution, London. 7 p.m. "Future Progress in Electrical Measuring Instruments." Dr. C. V. Drysdale.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

TOWNSEND buzzer.
Telescopic brass interior fittings for opal and imitation wax candle tubes.

Notes

A.S.E.E. Unemployment Benefit Scheme

During 1931 the Association of Supervising Electrical Engineers had to face for the first time in its history the question of unemployment among its members, and it has now approved an optional self-supporting scheme limited to each year and independent of the Association's exchequer. The subscriptions are in the form of shares of 3d. per week and unemployment benefit per week per share is 10s. for 13 weeks and 5s. for a further 13 weeks in any one year. In December of each year there will be a share-out, which may entitle a member taking up six shares to a refund of about £3 10s.; thus for an outlay of 8s. per annum, a member would be insured for the sum of about £58 10s. Those joining the scheme before December, 1932, will have the advantage of three years' membership of the scheme, which has an important bearing on the age limit clause.

Mr. L. W. Medcalf (vice-chairman) presiding at the Association's recent annual meeting, said that in spite of the difficult times subscriptions in 1931 showed an increase of 45 per cent., arrears of subscriptions had been reduced by 86 per cent., subscriptions paid in advance increased by 90 per cent., while the available cash to cover funds showed an increase of about 25 per cent.

International Electrical Congress, 1932

This Congress will be held in Paris from July 4th to 12th, 1932, to celebrate the fiftieth anniversary of the 1881 Paris Electrical Congress and Exhibition. Those wishing to attend are required to pay a registration fee of 250 French francs as subscribing members. The fee for a member of the family of a subscribing member is 50 fr. Fares at reduced rates will be allowed to those attending the Congress. Those desiring to attend should apply to the secretary of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2, for the requisite railway vouchers. Registration forms for the Congress and copies of the programme can also be obtained from the secretary of the I.E.E.

I.E.E. (North-Eastern Centre)

The annual meeting of the I.E.E. (North-Eastern Centre) was held at Newcastle-on-Tyne on April 11th, Mr. A. G. Shearer, the retiring chairman presiding. The report for the 32nd session (1931-32) showed a membership of 581 as compared with 558 in the previous year and 529 for 1929-30.

The Batti-Wallahs' Society

At the luncheon which is to be held at the Hotel Metropole on May 4th Sir Malcolm Campbell will be the chief guest.

Braided Cables for Overhead Lines

The use of braided conductors for overhead lines is uncommon in this country, and the object of a new British Standard Specification is primarily to assist the British manufacturers in their export trade, more particularly with New Zealand, where the use of braided cable is compulsory in certain circumstances. Users in New Zealand have in the past been unable to rely on the product being uniformly good, so the New Zealand Electric Supply Authority Engineers' Association requested the British Standards Institution to prepare a British Standard Specification, the adoption of which will probably be ultimately made compulsory in New Zealand. The points covered include the mechanical and electrical properties of the copper conductors and the quality and dimensions of the braiding. Copies of this specification (No. 446-1932) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

An Electric Vehicle Climbs Porlock

Messrs. Nelco, Ltd., inform us that one of their invalid carriages recently climbed Porlock Hill carrying a load of 15 stone. It was immediately afterwards brought down the hill on the electric brake, so that the motor had to do at least as much work coming down as going up; in order to prove that it was still in good running order it was afterwards driven for a distance of about a mile carrying a load of three passengers. It is believed that this is the first time that Porlock Hill has ever been climbed by an electrically propelled vehicle of any kind. The hill was in a very rough condition, and loose boulders caught the underside of the frame in places; in turning each of the bends the chair was taken up the steepest portion which could be found—a gradient of 1 in 2¾ at times. The output given by the motor was estimated to be about 2¼ h.p. throughout the climb.

The chair was dismantled on return to the works and was found to be in perfectly good condition throughout. The battery and the whole equipment of the chair were standard in all respects; the former item, which was supplied by Messrs. Oldham & Sons, Ltd., consists of a 36-V lead battery in moulded containers, weighing a total of 240 lb.

Appointments Vacant

Lady cooking demonstrator and sales assistant for Hammersmith Electricity Department.

Foreman for electrical maintenance in connection with the South Indian Railway Co.'s electrified suburban system in Madras.

Junior assistant engineer for Battersea Electricity Department.

Clerk for Bridport Electricity Department.

(See our advertisement pages to-day.)

Lighting Piccadilly Circus

When the new electric lighting system which is now being installed in Piccadilly Circus is switched on, probably about Whitsuntide, the Circus will be the first place of its size in the kingdom to come under "Class A" for intensity of illumination, according to the British Standard Specification. Apart from a small area at the top of Hill Street in the centre of Birmingham, there is no other place, so far as is known, which comes up to this "two foot-candle" standard. The Circus is the centre of "pleasureland" and there is so much light in this neighbourhood already that the effect of anything but the highest intensity would be lost. Every effort has been made to avoid any form of glare, and also the cold tunnel-like effect which is the result of reflecting all the light downward on to the streets, leaving everything above the lamp level in darkness. The new lights will not only illuminate the streets, but will also floodlight the buildings to the very top. The Shaftesbury Memorial, including the figure of Eros, will also be completely bathed in light. Immediately around the Shaftesbury Memorial there will be four standards, each having a single lantern at the top with a 1,500-W lamp. The standards are of solid bronze, fluted and decorated with the coat of arms of the City of Westminster. Bronze has been chosen so that eventually they will "weather" to the same colour as the basins of the Memorial. For economy's sake the 12 other columns, 11 of which are already erected around the Circus, are of cast-iron, which will be painted to look like bronze. Each of these will carry three 1,500-W lanterns. The new system has been planned for the Westminster City Council by the Edison Swan Electric Co., Ltd., working in collaboration with the St. James' and Pall Mall Electric Light Co., Ltd.; the former company is also supplying the standards and other lighting equipment.

The E.A.W.

A proposal to form a Yorkshire federation of branches of the Electrical Association for Women will be moved by the Halifax branch at a conference of branch delegates at Leeds on April 23. The five branches concerned are at Leeds, Bradford, Halifax, Harrogate, and Hull, and it is probable that other branches will be formed in the near future at Scarborough, Wakefield, and Sheffield. Mrs. W. B. Woodhouse, president of the Leeds branch of the E.A.W., will preside at the Leeds conference.

Callender's Jubilee Celebrations

CALLENDER'S Cable & Construction Co. celebrated its Jubilee on Tuesday by a luncheon given by the directors at the Savoy Hotel to seventy-seven Callender men, the number being the same as Sir Tom Callender's age. Those present were selected from all classes of employés of the company, regard being had only to length of service.

Proposing Sir Tom Callender's health, Sir Fortescue Flannery, Bt., chairman of the company, gave a brief history of the concern. Fifty years ago, he said, Callender's Bitumen, Telegraph and Waterproof Co. was founded by the late William Ormiston Callender, the original works at Millwall occupying something like an acre and giving employment to twelve men. This little works was some time afterwards moved down the Thames to Erith, where it then occupied four and a half acres. To-day sixty-four acres, largely covered with buildings fitted with modern plant, were in use at Erith, and the whole plant and factory was capable of almost indefinite expansion if circumstances required it.

The original capital of the company was £40,000; to-day it was £1,916,000. The original manufacture of Callender's was of cables for electric lighting; now the company was able to produce cables for all transmission purposes.

A sum of £250 had been subscribed towards a presentation to Sir Tom Callender, who had expressed a wish that this should take the form of a portrait. There would also be sufficient to make a presentation to Lady Callender, too.

Tribute to the achievements of Sir Tom Callender and to the progress of the company was also paid by Sir Malcolm Fraser, Bt., and Messrs. T. Lawrence, W. Monk, and Fincham.

In the course of his reply, Sir Tom Callender said that although he had been the mainstay of the company, he had been wonderfully helped from various parts. His brother James gave immense assistance in the early days, and to him the success of the Anchor Company was almost entirely due in its earlier operations.

In the early days they had had various troubles, but now they had got to the end of many of these difficulties, and, thanks to the excellent arrangements in their research and engineering and cable departments, no firm in the world was in a better position to take large and important contracts. Some years ago he had appreciated that the existing appliances of electrical distribution were totally inadequate and great improvement would have to be made, and that had followed. Everywhere one found Callender's standing well and holding an excellent position, and this was exemplified in the congratulatory telegrams received from German firms, who were once hated rivals, but with whom they were now working in cordial and friendly relations.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. George Barnard, M.I.E.E., Midland District engineer and manager of Callender's Cable & Construction Co., Ltd., is celebrating the jubilee of his connection with the company this week. He has sent us a souvenir pamphlet giving an account of his fifty years' cable-laying experience. It will be recalled that we published Mr. Barnard's portrait in our article on "Callender's Jubilee" which appeared a fortnight ago. The celebrations began in Birmingham and the Midlands on April 19th, when the staff and employés of the company, together with the staff of the Electric Supply Mains Department, attended a performance at the Empire Theatre, Birmingham. Presentations have been made to Mr. and Mrs. Barnard by his own and the Supply Department's staff and employés. To-day, Friday, a dinner is being given at the Queen's Hotel by the Supply Department's staff in honour of Mr. and Mrs. Barnard and also of Mr. Groves, the Mains Department engineer, and Mrs. Groves. Mr. Groves is shortly retiring, and on Tuesday last he was presented with an antique silver tankard by Sir Tom Callender. Mr. Barnard, acting for Callender's, put down the early underground street mains for private installations at Victoria Station (L.C. & D. Railway), at Gatti's, the Adelaide Gallery, Buckingham Palace, etc., in the early eighties of last century.

Mr. C. F. Wolsey, traffic superintendent of the Stockport tramways, has been appointed manager of the Douglas (I. of M.) tramway undertaking, at a salary of £400 per annum, rising to £500. There were 56 applicants for the post.

The address of **Mr. J. Howard Gill,** who has been appointed manager of the Transformer and Regulator Sales Department of the Fuller Electrical & Manufacturing Co., Ltd., is 5, Chancery Lane, W.C.1.

Lt.-Col. W. J. Kent, of Messrs. Taylor, Tunnicliff & Co., Ltd., has accepted an invitation to become president of the North Staffordshire Chamber of Commerce, in succession to Sir Francis Joseph.

Mr. C. G. Abbey, president of the Lancashire Dynamo & Crypto Co., of Canada, Ltd., is sailing from Montreal for Liverpool to-day (Friday). His time will principally be spent between the Trafford Park and Willesden works of Lancashire Dynamo & Crypto Ltd., the parent company.

Mr. J. H. Williams has been appointed a director of the Marconiphone Co., Ltd. He has been the manager of the company since early last year.

The following gentlemen have been elected members of the Batti-Wallahs' Society: **Col. Sir T. F. Purves, Messrs. T. O. Callender, M. J. Pattison,** and **J. F. Smith.**

Manchester Electricity Committee has placed on record its appreciation of the services of **Mr. L. R. Lee,** advising engineer to the mains section.

[Elliott & Fry.

Sir Basil Blackett, the retiring chairman of the I.I.C.

Some time ago **Sir Basil Blackett** intimated to the Courts of Imperial and International Communications, Ltd., and Cables and Wireless, Ltd., that, in order to be relieved of day-to-day executive work and to have spare time for other public interests, he proposed to resign his position as Government approved chairman of Imperial and International Communications, Ltd., and Government approved director of Cables and Wireless, Ltd. Sir Basil Blackett has now formally tendered his resignation as from April 19th. In accepting his resignation the courts have invited Sir Basil to continue his association with the two companies as an ordinary director and he has accepted this invitation.

Pending decisions on certain questions now under discussion between the Court and the Advisory Committee, the governor of Cables and Wireless, Ltd., **Mr. J. C. Denison-Pender,** is undertaking the duties of chairman of Imperial and International Communications, Ltd.

Mr. Tom Hall, manager of the Burton-on-Trent electricity undertaking, has been presented with a walnut writing desk by the employés of the Department on completion of twenty-one years' service. Mrs. Hall received a canteen of cutlery. The presentation was made at the first annual staff dinner at the Town Hall recently. Mr. C. J. Melbourne, who presided, showed how the undertaking had grown since 1911 when Mr. Hall was appointed. Acknowledging the gifts, Mr. Hall said that he had served in every department of the undertaking, in which he started as a boy of twelve.

Mr. Stuart F. Philpott, A.M.I.E.E., has resigned his position as chief electrical engineer to the Garrard Engineering and Manufacturing Co., Ltd., Swindon, to join a colleague, **Mr. F. S. Adkins,** A.M.I.E.E. (formerly manager of the Electrical Department of Messrs. R. W. Crabtree & Sons, Ltd.), in the establishment of a manufacturing business at Banbury, Oxon. The principal product will be fractional h.p. motors, a subject on which Mr. Philpott has written for the ELECTRICAL REVIEW.

[Claude Harris.]

Catherine Countess of Westmorland, a new vice-president of the E.A.W., and Mrs. E. D. Paterson, member of the Council

At the annual meeting of the I.E.E. (North-Eastern Centre) held at Newcastle-on-Tyne on April 11th, **Mr. C. Turnbull** was elected chairman for the ensuing year and **Mr. F. H. Williams** was elected vice-chairman.

Colonel S. E. Monkhouse, assistant general manager of the Newcastle-upon-Tyne Electric Supply Co., Ltd., has been appointed chairman of the Tyneside Industrial Development Board in succession to Mr. Herbert Shaw.

Mr. C. H. Merz, of Messrs. Merz and McLellan, who has been on a business visit to South Africa, has arrived back in London.

Dr. F. T. Fawcett is the president-elect of the Institute of Wireless Technology.

Capt. E. C. Lloyd, who has been in Government service for forty-six years, has retired from the position of Chief Superintendent of Telegraphs at the G.P.O., Birmingham.

Mr. A. H. Avery, London manager for Brook Motors, of Huddersfield, has resigned his position. All further communications to him should be forwarded to "The Haven," Canford Magna, Dorset.

Mr. E. A. Hilton has been appointed branch manager in Manchester to Henrion Carbons, Ltd.

Obituary

Mr. W. A. Gooding.—The death occurred on April 10th of Mr. William Arthur Gooding, head of the firm of W. A. Gooding and Sons, electrical contractors, of The Green, Southwick, and Brighton.

Mr. P. H. S. Kempton.—We learn with regret of the death which occurred on April 10th, of Mr. Percival H. S. Kempton, pupils' demonstrator with Messrs. W. H. Allen, Sons & Co., Ltd., of Bedford, since 1919. The initials "P. H. S. K." are well known to readers of our "Book Reviews" page.

We regret to announce the death of two members of the staff of Standard Telephones and Cables, Ltd. **Mr. L. J. Keogh,** who was manager of the company's Dublin office, died on April 9th at the age of 40, after being with the company since 1911; and **Mr. H. E. Dashwood,** the chief inspector of the Engineering Division, died on April 16th, after a short illness, at the age of 49; he joined the company in 1904.

The memorial to the late **General Sir John Monash,** chairman of the Victorian Electricity Commission, is to take the form of a bronze equestrian statue to be erected near the Shrine of Remembrance at Melbourne. An appeal is to be made throughout the State for £7,500, the estimated cost, and sculptors in all parts of the Empire, as well as Australia, are to be invited to take part in a limited competition for the design.

Wills.—Sir William Henry Cowan, chairman of Messrs. Parkinson and Cowan, Ltd., left personal estate in Great Britain valued at £31,973.

The estate of **Dr S. Z. de Ferranti,** which was originally valued at £151,467, has now been resworn at £311,467.

Mr. E. Darrah, a director of Baxendale & Co., Ltd., left £71,532.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Electrical and General Distributors, Ltd.—Private company. Registered April 12th. Capital, £1,000 in 10s. shares (1,900 ordinary and 100 founders'). Objects: To carry on the business of electrical and general wholesale and retail merchants and manufacturers, distributors of and dealers in electrical and radio goods, &c. The directors are: G. Mellor (chairman and permanent director), 82, Hamlet Gardens, W.6, and C. Dunn, 24, Jay Mews, Queen's Gate, S.W.7. Registered office: 154, King's Cross Road, W.C.1.

Berclif, Ltd.—Private company. Registered April 13th. Capital, £700 in £1 shares. Objects: To acquire the business of wireless manufacturers now carried on by G. C. Simmonds and N. B. Simmonds at Smethwick, Staffs, as "Simmonds Bros.," and particularly the trade mark "Berclif," No. 455,632. The directors are: Geo. C. Simmonds, 32, Cape Hill, Smethwick; N. B. Simmons and G. S. Simmonds, both of 105, Perry Hill Road, Quinton, Birmingham. Registered office: 38, Rabone Place, Smethwick.

Light-o'-Day Lamps, Ltd.—Private company. Registered April 13th. Capital, £200 in 1s. shares. Objects: To carry on the business of electric lamp manufacturers, &c. The subscribers are: H. T. Gerrard, 29, Fairmead Road, Holloway, N.19, and W. F. Doggett, 28, Hardman Road, Kingston, Surrey. Secretary: H. T. Gerrard. Registered office: 200, Euston Road, N.W.1.

Radio Service (Nelson), Ltd.—Private company. Registered April 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale and retail dealers in and makers and distributors of wireless receiving instruments, &c. The subscribers are: T. G. Hopkinson, "Highfield," Scotland Road, Nelson, and seven others.

Electrical and Engineering Products, Ltd.—Private company. Registered April 14th. Capital, £500 in £1 shares. Objects: To adopt an agreement with H. A. O'Brien and C. H. H. Downing, and to carry on the business of commission agents and vendors of electrical and mechanical appliances and apparatus comprised therein. The permanent joint managing directors are: H. A. O'Brien, "Maricourt," 23, Farm Way, Worcester Park, Surrey, and C. H. H. Downing, "Mead Lodge," Manor Road, Thames Ditton, Surrey. Registered office: Ashley House, 185, Fleet Street, E.C.4.

Sunbeam Vacuum Cleaner Co., Ltd.—Private company. Registered April 14th. Capital, £1,500 in £1 shares. Objects: To acquire the business of a vacuum cleaner manufacturer hitherto carried on by F. H. Katz at 18, Shepperton Road, Islington, N. The directors are: F. H. Katz, 8, Rose Glen, Colindale, N.W.9, and J. T. Rankin, 49, Vallance Road, Alexandra Park, N.22. Solicitor: H. B. Shepheard, 4, Broad Street Place, E.C.

Megs Electrical Co., Ltd.—Private company. Registered April 14th. Capital, £600 in £1 shares. Objects: To carry on the business of electrical, automobile and general engineers, &c. The directors are: D. Myer, M. Myer, both of 52, Canfield Gardens, N.W., and R. A. C. Reid, 165, Holland Road, N.W. Secretary: D. Myer. Registered office: 25, Paddington Street, W.1.

Psychon, Ltd.—Private company. Registered April 18th. Capital £1,250 in 1,000 10 per cent. cumulative preference shares of 10s. each and 3,000 ordinary shares of 5s. each. Objects: To carry on the business of manufacturers of and dealers in radio, telephone, telegraph and electrical instruments and apparatus, &c. The first directors are: M. C. A. Crauford, North View, Lydd, Kent, and two others. Registered office: 4, Westminster Palace Gardens, Victoria Street, S.W.1.

Returns of Electrical Companies

Electric Advertising Clocks, Ltd.—Capital, £36,000 in 30,000 ordinary shares of £1 and 120,000 deferred shares of 1s. each. Return dated December 31st, 1931. 27,492 ordinary and 120,000 deferred shares taken up. £8,600 paid (10s. per share on 17,200 ordinary shares), £16,292 considered as paid (£1 per share on 10,292 ordinary and 1s. per share on 120,000 deferred shares). Mortgages and charges: Nil.

Radio Experts, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1931. 200 shares taken up. £200 paid. Mortgages and charges: Nil.

Implitico, Ltd.—Capital, £3,000 in £1 shares. Return dated December 2nd, 1931. All shares taken up. £3,000 paid. Mortgages and charges: Nil.

Davies, Kent & Stewart, Ltd.—Capital, £3,500 in 2,500 preference and 1,000 ordinary shares of £1 each. Return dated December 28th, 1931. 1,974 preference and 1,000 ordinary shares taken up. £2,974 considered as paid. Mortgages and charges: £1,050.

Gorford Bros., Ltd.—Particulars filed of £1,500 debentures authorised March 30th, 1932, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £850.

Belling & Lee, Ltd.—Particulars filed of £10,000 debentures authorised February 29th, 1932, charged on freehold land and buildings on the Cambridge Arterial Road, Enfield, Middlesex, the amount of the present issue being £7,000. Satisfaction to the extent of £1,500 (remaining £500 unissued having been cancelled) on March 21st, of a series of debentures authorised by resolution dated November 21st, 1925, and registered November 27th, 1925.

Cooke & Stevenson, Ltd.—Charge on Columba House, Solly Street, and Corn Hill, Sheffield, dated April 1st, 1932, to secure £1,600. Holder: P. K. Wake, 25, Bank Street, Sheffield.

British Electric Transformer Co., Ltd.—Land registration charge on land in Bridport Road, Edmonton, dated March 31st, to secure all moneys due or to become due from the company to Barclays Bank, Ltd., not exceeding £30,000.

County of London Electric Supply Co., Ltd.—Satisfaction in full on March 15th of trust deed dated March 23rd, 1922, and registered April 4th, 1922, securing £500,000 debenture stock.

Electric Construction Co., Ltd.—Satisfaction to the further extent of £680 on March 31st of trust deed dated December 16th, 1897, and registered September 10th, 1908, securing £200,000 4 per cent. perpetual first mortgage debenture stock.

Emery & Co., Ltd.—W. H. C. Wayte, 31, Albion Street, Hanley, Stoke-on-Trent, ceased to act as receiver on February 17th, 1932.

Cavendish Trading Co., Ltd.—C. Clay, 5a, Palace Chambers, Bridge Street, Westminster, was appointed receiver and manager on April 6th, under powers contained in debenture dated December 8th, 1931.

Edison Bell, Ltd.—F. S. S. Tull, of 3, Frederick's Place, Old Jewry, E.C.2, was appointed receiver and manager on April 6th, under powers contained in mortgages and charges dated September 21st, 1931.

Orford Electric Light and Power Co., Ltd.—A. D. Wykes, 67, Watling Street, E.C.4, ceased to act as receiver on April 6th.

Baughan & Co., Ltd.—Satisfaction to the extent of £500 on February 22nd, 1932, of debentures authorised March 7th, 1916, and registered March 8th, 1916. (According to the register of mortgages, the debentures registered March 8th, 1916, originally secured £4,000.)

Nivalight (1928), Ltd.—Capital, £5,000 in £1 shares. Return dated December 29th, 1931. All shares taken up. £5,000 paid. Mortgages and charges: Nil.

Cattley Accumulator Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 30th, 1931. 2,850 shares taken up. £1,900 paid. £950 considered as paid. Mortgages and charges: Nil.

Matthews Electric Signs, Ltd.—Capital, £2,000 in £1 shares. Return dated December 19th, 1931. 1,512 shares taken up. £909 10s. paid (being £1 per share on two and 15s. per share on 1,210 shares). £300 considered as paid on 300 shares. Mortgages and charges: Nil.

Zenith Electric Co., Ltd.—Capital, £26,250 in 25,000 ordinary shares of £1 and 25,000 deferred shares of 1s. each. Return dated December 17th, 1931. 25,000 ordinary and 23,334 deferred shares taken up. £5,563 paid on 5,563 ordinary shares. £20,603 14s. considered as paid on 19,437 ordinary and 23,334 deferred shares. Mortgages and charges: Nil.

City Notes

Babcock & Wilcox, Ltd., report a net profit for the year ended December 31st last of £569,620, as compared with £609,302 in the preceding year, from which is deducted a contribution of £19,837 to the staff pension fund, and after adding £49,783 brought in and £50,000 transferred from dividend equalisation fund there is a total of £649,576 available. It is proposed to pay a final ordinary dividend of 7 per cent., making 14 per cent., less tax, for the year (against 14 per cent., tax free), and to carry forward £32,671. The report states that it was not possible during 1931 to secure sufficient orders to keep the factories fully employed, due entirely to the world-wide depression which has affected every industry and has held up development both at home and abroad more particularly in electrical, shipbuilding, and colliery undertakings. In view of the continued depression, economies in the parent company and its subsidiaries have been introduced. In order to concentrate manufacture as far as possible, and thus reduce overhead expenses, it was decided to transfer work hitherto carried on at the Lincoln works to Renfrew, Dumbarton, and Oldbury. These economies have meant reductions in staff. It has been deemed prudent to transfer from reserve, which stood at £900,000, the sum of £400,000 to be available as a special reserve for depreciation on investments, depreciation on capital employed abroad, and other contingencies. Since December 31st last the market value of the company's investments has risen considerably, and at the present date they are worth more than the cost shown in the balance sheet. The associated and subsidiary companies have, in common with the parent company, felt the effect of the universal diminution of trade, but the aggregate return received from them is regarded as satisfactory. At an extraordinary meeting which will follow the annual meeting a resolution will be submitted altering the articles of association so as to ensure that the company shall always remain under British control. Meeting: May 3rd.

Bruce Peebles & Co., Ltd., in their report for 1931 state that the results are again unsatisfactory, and they have continued to be adversely affected by the industrial depression both at home and abroad. The trading loss, after adding to it provision for bad debts in respect of sales made prior to December 31st, 1930, anticipated loss on foreign exchange, and a trading loss of the Canadian subsidiary (£1,350), and taking into account £11,407 from certain reserves which are not now required, is £7,796, as compared with a trading loss of £29,511 in the preceding year. From this is deducted £175 brought in, leaving £7,620. A sum of £8,000 has been transferred from the general reserve, reducing that reserve to £66,000, leaving a credit balance of £380 to be carried forward. The directors do not recommend any dividend for the past year on either the prefer-

ence or the ordinary shares. The preference dividend is cumulative to the extent of 7½ per cent. per annum. The report states that the manufacture of mercury arc rectifiers under the arrangements with Brown Boveri & Co., Switzerland, is making good progress, and some interesting orders have been booked, notwithstanding that competition in this special branch of the industry is being severely felt. The resignation of Mr. S. E. Bastow, managing director, owing to ill-health, is recorded. Meeting: April 27th.

The Edison Swan Electric Co., Ltd.—The annual meeting was held on April 19th, Mr. C. F. Spencer (chairman) presiding. In presenting the report and accounts (ELEC. REV., April 15th, p. 580), the chairman said that Ediswan Cables, Ltd., had been profitably engaged during the year. They had grown in the last few years into a large distributing organisation. The reduced profit was due to some extent to the increased publicity costs of placing new types of products on the market, from which they expected to benefit in the current year, a reduction in selling prices and income from certain products, greater competition in certain lines owing to the general trade depression, dumping during the last three months of the year, and losses on exchange. The general depression had not been felt so much in domestic sales, which was their principal business, as in the heavier industries. Referring to the outlook, he said competition became more severe as trade diminished, and if the international conferences did not yield any result he anticipated that the economic depression would be aggravated. In view of the relatively large amount of reserve the company possessed, it might be considered that the dividend should have been maintained at the usual rate, but while their sales had been kept up fairly well last year, it was impossible to take that condition as a guide for the current year owing to the uncertain outlook for the general trade of the country. The board therefore desired to adopt a conservative attitude.

Telephone Properties, Ltd.—The annual meeting was held on April 15th, Sir Alexander Roger (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, April 8th, p. 545) the chairman said that, following the creation of the Cia. Anonima Nacional Telefonos de Venezuela, the Venezuelan assets were vested in that company in exchange for debentures and shares, and by agreement in August last their company took over these investments from the Venezuela Telephone & Electrical Appliances Co., Ltd. The progress of the Nacional Co. was indicated by the increase in the number of telephones during the past three years, the number of stations for 1929, 1930, and 1931 being 14,144, 16,057, and 17,077 respectively. The increase for 1931 was at the rate of 6.4 per cent. The Nacional Co., whose system was now 80 per cent. automatic, was steadily equipping itself to form part of an international telephone system, and arrangements were almost completed for the establishment of a radio service between Venezuela and Europe *via* the United States. Further expansion in the radio communication field should follow as a natural corollary.

The Electrical Distribution of Yorkshire, Ltd.—At an extraordinary meeting held on April 5th resolutions were passed approving the raising of the capital to £1,900,000 by the creation of 400,000 new preference shares of £1 each; new articles of association were also passed. Mr. R. W. Wickham (chairman), who presided, said that substantial sums were owing to the Yorkshire Electric Power Co. for loans advanced for extensions of the company's system. It was to repay these advances and to provide for further development that additional capital was required. The price of the new shares would be 21s. each, and they would carry a fixed cumulative preferential dividend at the rate of 6 per cent. per annum. It is reported that the issue was largely oversubscribed.

The Telephone Manufacturing Co. (1929), Ltd., reports a profit for the year ended December 31st last of £22,086, to which is added £6,807 brought in, making £28,893. From this £3,635 has been appropriated for income tax, and it is proposed to carry forward the balance of £25,258. The report states that the directors consider that the best interest of the members would not be served by the declaration of a dividend, as the resources of the company should be conserved in view of the unsettled industrial conditions. The works have not been fully employed during the year under review, but the value of the orders in hand at January 1st, 1932, was greater than at the corresponding date of last year. Prices have remained very keenly competitive. Meeting: May 9th.

The Brazilian Traction, Light & Power Co., Ltd., has announced that the exchange situation in Brazil has been for some time past so difficult that it has been impossible, except in a very restricted degree, to procure foreign exchange for the purpose of remitting funds, and this condition still continues. In the circumstances, and in order to conserve cash resources, the board considers it inadvisable to declare a cash dividend at this time. It has therefore declared a stock dividend on the ordinary shares of no par value at the rate of one fully paid ordinary share for each fifty fully paid shares held.

The North Somerset Electric Supply Co., Ltd., reports a profit of £30,255 for 1931, to which is added dividends from subsidiary companies, interest received and £1,661 brought in, making £33,506. After deducting debenture interest, &c., it is proposed to pay a dividend of 7 per cent. on the ordinary shares, leaving £1,719 to be carried forward. During the year the capital was increased by the creation of 100,000 5½ per cent. cumulative preference shares of £1 each. The sales of electricity amounted to 11,265,767 kWh, as compared with 8,135,948 kWh in 1930.

The Insull Group.—A *Reuter* message from Chicago states that in addition to the appointment of a receiver for the Middle West Utilities Co., a receivership has also been asked for in respect of three more Insull holding companies. These are:—Insull Utilities Investments, Inc., the Corporation Securities Co., and the Mississippi Valley Utilities Investment Co.

The Birkdale District Electric Supply Co., Ltd., reports a profit, after deducting debenture interest, &c., of £5,568, to which is added £6,059 brought in, making £11,627. A dividend of 6 per cent. is paid and £2,760 is carried forward.

Madras Electric Tramways (1904), Ltd.—Presiding at the annual meeting on April 18th, Mr. J. G. B. Stone (chairman) said that traffic receipts showed an increase of 6 per cent., and the number of passengers carried of 5.4 per cent. over 1930. Notwithstanding the continuation of motor-omnibus competition the traffic receipts were now equal to the maximum reached before the advent of buses. Various improvements which had contributed to this included the doubling of part of the track and the adoption of corridor cars for the cross bench type.

The Western Union Telegraph Co. reports gross operating revenues of $108,736,948 for 1931 as compared with $130,581,858 in 1930. Operating expenses totalled $99,215,431, and the balance transferred to surplus account was $5,974,499. Dividends absorbed $7,837,683, leaving a total surplus at December 31st last of $93,333,051.

The American Telephone & Telegraph Co. reports a net income for the first quarter of 1932 of $41,984,247, representing earnings of $2.07 per share, against dividend requirements of $2.25. There is thus a net deficit of $3,285,043, after dividend disbursements, as compared with a net balance of $7,138,885 for the corresponding period of 1931.

The Gateshead and District Tramways Co. reports a net profit for 1931 of £21,485, as compared with £27,776 in 1930, to which is added £23,667 brought in, making £45,152. It is proposed to pay an ordinary dividend of 6 per cent for the year and to carry forward £23,443. Mr. O. H. Corble has been appointed a director in place of Mr. W. M. Teasdale, who has resigned.

The City Electric Light Co., Ltd. (Brisbane) reports a credit balance, after making certain allowances, of £110,209 for the year ended January 31st last, to which is added a balance brought forward, making £110,260. A final ordinary dividend of 4 per cent. is paid, and £52 is carried forward.

The West London & Provincial Electric & General Trust, Ltd., reports a net revenue for the year ended March 31st last of £12,872, as compared with £21,096 in the preceding year. It is proposed to pay an ordinary dividend of 5 per cent. (against 9 per cent.), and to carry forward £705.

The Yorkshire (Woollen District) Electric Tramways, Ltd., reports a profit of £28,451, to which is added £14,706 brought in, making £43,157. The ordinary dividend is 10 per cent. and £16,157 is carried forward.

The Jarrow and District Electric Traction Co., Ltd., in its report for 1931, shows a surplus of £2 which has been deducted from the loss of £109 brought forward from the previous year.

The Shawinigan Water & Power Co. has declared a dividend of 25 cents per share on the common stock for the quarter ended March 31st.

The Sun Electrical Co., Ltd., has announced an interim dividend of 2½ per cent. less tax, on the ordinary shares (against 5 per cent.).

Joseph Lucas, Ltd., have announced an interim dividend of 5 per cent. (1s. per share) on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

THE principal feature in the Stock Exchange continues to be the strength shown by the gilt-edged list as a whole. The Budget, whatever its immediate influence, will have the ultimate effect of maintaining this robust tone in British Government stocks and others of kindred character. Borrowers find that it is no longer necessary to pay 5 per cent., provided they have good security to offer, and, in consequence, the 5 per cent. stocks are being raised to levels at which they come up to the same plane as the 4½ per cent. stocks, for which there is a keen demand at a few points below par. For instance, the London and Home Counties Joint Electricity 5 per cent. stock, which came out at 101½, now stands at a premium of 13s. 9d. Central Electricity 5 per cent., which allottees obtained at 95, has risen to 7⅞ premium, a gain of ½ on the week. The "Three Counties" 5 per cent. debenture stock, privately placed at 94, is 101½, showing a rise of 1½. Money is coming back into this country from the United States, because the investor is frightened by the increasing American lawlessness that pays regard neither to life nor property. On the Continent, the ramifications of the Kreuger and Toll affair are so wide as to arouse apprehension in the minds of moneyed people, who, putting safety first, prefer to leave foreign investments alone in favour of the absolute security offered by British Government stocks.

Home Railways

The slight setback which occurred last week in the new 5 per cent. stocks of the two Underground companies has been recovered, and Metropolitan District 5 per cent. debenture at 6½ is ½ higher. Metropolitan Railway 5 per cent. debenture has gained a point at 3½ premium. Both the stocks were issued, it may be recalled, at 97½. The Metropolitan issue is now 25 per cent. paid; the District scrip is 20 per cent. paid. The assented stocks of the Central London Railway, preferred ordinary and deferred, held the gains which they secured last week, and remained at 72½, but the ordinary stocks continue heavy, and Metropolitans have gone back a point to 31¼. If the company continues to pay the dividend distributed for last year, 3½ per cent., the yield on the money at the present price of the stock is a little over 11 per cent. Underground Electrics keep dull at 18s.

London Tramways

London and Suburban Traction 5 per cent. preference have fallen a florin to 3s. 9d., business being recorded recently at 3s. and 4s. 6d. The ordinary have marked 3d. each. Like

the preference, they are of £1 denomination. London United Tramways 5 per cent. preference are being dealt in on the basis of 1s. 9d. The 4 per cent. debenture stock keeps steady at 57¼. Metropolitan Electric Tramway 4½ per cent. debenture stock has changed hands, this month, on the basis of 81½, and the 5 per cent. debenture stock at 88¾.

Home Electricity Supply

Charing Cross ordinary shares have just gone ex share bonus and are quoted at 29s. A few other companies' ordinary shares are ex dividend. London Electrics have hardened to 28s. Amongst the Provincial issues, Lancashire Light and Power strengthened to 27s. xd., which puts them upon nearly the same level as the shares of the London group. Lancashire 5 per cent. debenture has been in demand, and can be sold at 100. It is difficult to obtain an offer of stock, even at 102. The Mid-Cheshire Electricity Supply Company is making an issue of 40,000 ordinary shares at a premium of 2s. 6d. Payment for the shares is spread over instalments that finish by the end of August. The offer will remain open until Wednesday in next week. The St. Austell and District Lighting and Power Company is taking powers to create 10,000 additional 7 per cent. preference shares, which it is proposed to issue at 22s. 6d. The present issued capital is £29,700 in preference and ordinary shares. Llanelly and District ordinary, upon which the dividend has been lately increased, are 15s. 7½d. xd. The newly issued Electrical Distribution of Yorkshire 6 per cent. preference shares were heavily over-subscribed, and are at 2s. 9d. premium.

Dollar Stocks

American Telephone and Telegraph capital stock at 135 is 5 down, but International Telephones are ½ higher at 7½. American Telephone and Telegraph ordinary is almost the only American stock, outside the lists of U.S.A. Government and municipal issues, that stands above its nominal price of 100. The study of to-day's quotations brings home, more forcibly than anything else can, the mess, to put it colloquially, into which American finance has fallen, and from which such incidents as those of the Middle West Utilities receivership are not likely to rescue it. Joint receivers have been appointed for the Middle West Utilities Company, the parent holding company for the Insull public utility group. The Middle West Utilities has a capital of no less than 500 million pounds sterling.

The Brazilian Traction Company, owing to the difficulty of the exchange position in Brazil, which makes it extremely expensive to procure foreign exchange for the purpose of remitting funds, has reverted to the payment of the dividend in scrip. One fully paid ordinary share for each fifty shares held is therefore to be distributed to shareholders registered on April 30th. In April last year the company was also distributing stock dividends, but in each of the succeeding quarters it paid 25 cents in cash. Nobody is particularly surprised, of course, at the step, in view of the exchange difficulty, and the price of the shares is only a dollar down at 11. Rio Tramway 50-year mortgage bonds have dropped to 77½, San Paulo Tramway debenture to the same price, being falls of 2 and 3 respectively. Of the Canadian utility shares, Shawinigan have hardened to 16½. Montreals went back to 32½. Power Corporation of Canada, at 14, are 2½ down. Further falls of substantial character have taken place in the Mexican issues, ranging from a point in Mexican Light and Power 5 per cent. first mortgage bonds, to as much as 8 in the same company's 7 per cent. preferred shares.

Cables and Wireless

Globe Telegraph and Trust ordinary shares have fallen £1 to 4½, and the Cables & Wireless stocks show a heavy tendency. Great Northerns gave way to 22½. Marconi Marines are flat at 25s. Anglo-Portuguese Telephone shares at 17s. 6d. are marked ex dividend, as are Telephone Properties at 15s. International Automatic Telephone ordinary and "B" deferred have come together at 28s. 9d., which shows a fall. Telegraph Constructions have dropped 10s. to £9, which, it may be observed, is a discount of £3 upon the nominal value of these £12 shares. Atlas Light & Power ordinary weakened to 10s. 9d., the preference to a guinea. Oriental Telephones at 2 3-16 have a small gain to their credit.

Manufacturing and Equipment

Babcock & Wilcox are better at 45s. on the report, which shows a net profit for last year of £569,620, being about £40,000 down on the year as compared with twelve months previously. The dividend, as already announced, is to be 14 per cent. less tax, instead of 14 per cent. free of tax. It is proposed to alter the Articles in such a way as to ensure that the company shall remain under British control. The Chancellor of the Exchequer was expected to introduce further protection for the iron and steel trades, and, in anticipation of this, prices in this section went a little better. Associated Electrical Industries recovered 9d. to 18s. 3d., following upon the decline caused by the dividend disappointment, but General Electrics, at 35s. 9d., are 1-16 lower. Henleys are better at 5 3-16. Enfields rallied to 3¼ after being 3 7-16. Brush ordinary at 57 are 3 points lower. Small falls have occurred in British Insulated and British Aluminium ordinary. The rubber share market shows a faint tendency to harden. Whitehall Electric preference at 20s. and the debenture at 102½ have gone back in sympathy with the weakness of certain American utility issues.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. April 19.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	1	15	15	60/9xd.	—	4 18 9
Brompton Ordinary	1	8½	8½	28/-xd.	—	5 0 0
Central Electricity 4½% Deb.	Stock	4½	4½	95½	—	4 14 3
Charing Cross Ordinary	1	8½	8½	29/-xd.	—	4 16 7
Chelsea	1	8½	8½	26/-xd.	+9d.	5 7 8
City of London	1	10	10	37/6	—	5 6 6
Clyde Valley	1	8	7	28/9	—	4 17 6
County of London	1	11	10½	43/9	—	4 16 0
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Dis. Yorkshire	1	9	9	35/-	—	5 2 10
Elec. Supply Corporation	1	11	—	47/6	—	4 12 7
Kensington Ordinary	1	8	8	28/6	+6d.	4 18 3
Lancs. Light and Power	1	6½	7	27/-xd.	+9d.	5 3 8
London & Home Counties 4½% Deb.	Stock	4½	4½	95½	+2½	4 14 3
London Electric	1	9	9	28/-	+6d.	5 0 0
Metropolitan	1	10	10	41/3	—	4 17 0
Midland Counties	1	7	7	28/9	—	4 17 5
Mid. Elec. Power	1	8	8	30/6	—	5 5 0
Newcastle-on-Tyne Ordinary	1	6	6	23/9	—	5 1 1
Do. 7% Pref.	1	7	7	27/6	—	5 1 10
Northampton	1	10	10	40/9	—	4 18 3
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	24/6	—	4 18 0
St. James' and Pall Mall	1	8	8	28/-	—	5 0 0
Scottish Power	1	8	—	28/9	—	5 11 4
South London	1	8½	8½	28/-xd.	+9d.	5 0 0
Urban Ordinary	1	7	—	28/-	-3d.	5 0 0
Westminster Ordinary	1	8½	8½	28/-	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	-2/-	7 10 0
Yorkshire Elec.	1	8	8	33/9	—	4 14 10
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	72½	—	5 10 4
Metropolitan	„	4	3½	31½	-1	11 2 2
Do. District	„	5	4½	51½	—	8 14 10
Underground Electric	1	8	7	18/-	—	7 15 7
TELEGRAPHS AND TELEPHONES.		1929.	1930.			
American Tel. & Tel.	$100	9	9	135	-5	6 13 4
Anglo-Am. Tel. Pref.	Stock	6	6	99½	—	6 0 7
Do. Def.	„	1½	1½	23½	—	6 7 8
Cables & Wireless 5½% Pref.	„	5½	5½	45½	-2	—
Do. A 7½% Ord.	„	Nil	—	14	-1	—
Do. B Ord.	„	Nil	—	9	—	—
Globe Tel. and T. Ord.	10	10	8½	4½	-1	—
Do. do. Pref.	10	6	6	7	—	8 11 6
Great Northern Tel.	10	20	20	22½	-½	8 17 10
Marconi-Marine	1	15	15	25/-	-½	8 0 0
Oriental Telephone Ord.	1	12	12	2 3/16	-1/16	*5 9 7
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	9	—	—
British Electric Traction Def. Ord.	„	5	5	750	—	—
Do. do. Pref. Ord.	„	8	8	121½	—	6 11 9
Brazil Traction	100	8	—	11	-1	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	89½	—	5 11 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/9	-2/-	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	32½	-5	15 7 8
Mexico Light Common	100	Nil	Nil	15½	-2	—
Do. 7% Pref.	100	7	7	29½	-8	23 14 8
Do. 1st Bonds	—	5	5	71½	-1	6 19 10
Victoria Falls Ord.	1	15	15	60/-	-1/16	5 0 0
Yorkshire (West Riding)	1	Nil	Nil	5/3	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	6	18/3	+9d.	4 11 5
Do. Pref.	1	8	8	28/9	—	5 11 4
Babcock & Wilcox	1	15	14	45/-	+1/16	6 4 5
British Aluminium Ord.	1	10	10	24/6	-6d.	4 1 8
British Insulated Ord.	1	15	15	59/9	-3d.	5 0 5
Brush Ord.	Stock	10	5	57	-3	8 15 0
Callender's	1	15	15	57/6	—	5 4 2
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/-	30	30	18/9	—	8 0 0
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	89½	—	5 11 10
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3½	—	7 2 10
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	10/-	—	—
Ever Ready	5/-	35	35	24/6	—	7 2 10
Ferranti Pref.	1	7	7	22/-	—	6 7 3
G.E.C. Pref.	1	6½	6½	26/-	—	5 0 0
Do. Ord.	1	14	10	35/9	-1/16	5 12 0
Henley's	1	30	30	5 3/16	+1/16	5 15 8
Do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	5/9	—	—
Johnson & Phillips	1	10	10	1	—	10 0 0
Siemens Ord.	1	7½	7½	21/3	—	7 1 2
Telegraph Construction	12	10	7½	9	-½	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930

34,247. "Recording of certain phenomena such as moving electric waves, and other rapid electric phenomena, and apparatus for carrying out this method." R. Bradfer. November 13th, 1929. (369,645.)

34,614. "Electrical adjustable resistance." A. Ulitowsky. November 17th, 1930. (369,646.)

35,134. "Luminous electric discharge tubes." G. Claude. December 7th, 1929. (369,558.)

37,595. "Manufacture of electric rare gas discharge lamps." A. Lederer. December 28th, 1929. (369,596.)

37,918. "Electric heater for circulating water." C. Cante. December 16th, 1930. (369,560.)

38,295. "Sparking plugs for internal combustion engines." M. T. Green. December 19th, 1930. (369,653.)

38,338. "Electron discharge tubes or thermionic valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 9th, 1930. (369,655.)

38,386. "Remote control systems." Automatic Electric Co., Ltd., G. A. Burns, and P. F. Gunning. December 19th, 1930. (369,570.)

38,456. "Thermionic oscillation generators." Marconi's Wireless Telegraph Co., Ltd., B. J. Witt, and C. S. Franklin. December 20th, 1930. (369,575.)

38,476. "Electrical circuit arrangements using a gas discharge device, applicable to direct current amplifiers, and other electrical control, amplifying and relaying apparatus." W. B. Mackenzie, H. Smith, and E. G. Hill. December 20th, 1930. (369,578.)

38,609. "Grids or plates for electric accumulators." E. T. Williams, H. Salmon, and Expanded Metal Co., Ltd. December 22nd, 1930. (369,605.)

38,615. "Radio communication systems." C. E. Verdan. January 14th, 1930. (369,607.)

38,664. "Telephone and telegraph transmission systems." Standard Telephones & Cables, Ltd., and P. R. Thomas. December 23rd, 1930. (369,630.)

38,710. "Telephonic and like signalling transmission systems." Electrical Research Products, Inc. January 1st, 1930. (Addition to 338,971.) (369,636.)

38,737. "Synchronous induction dynamo-electric machines." British Thomson-Houston Co., Ltd., and W. J. Gibbs. December 23rd, 1930. (369,638.)

38,771. "Wireless transmission systems." S. Salto. December 23rd, 1930. (369,660.)

39,334. "Devices for indicating when a flash-over has occurred across an insulator or chain of insulators." Bullers, Ltd., and H. C. R. Dahnall. December 31st, 1930. (369,671.)

1931

80. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. January 7th, 1930. (Addition to 314,332.) (369,678.)

81. "Directional radio transmitting systems." Telefunken Ges. für Drahtlose Telegraphie, and W. Ludenia. January 15th, 1930. (369,679.)

1,798. "Electrical production of optical effects, and electric discharge and other apparatus therefor." G. W. Walton. January 19th, 1931. (369,698.)

2,107. "Electric accumulators." Britannia Batteries, Ltd. January 21st, 1930. (369,700.)

3,016. "Electric batteries." E. S. Calvert and J. L. Russell. January 30th, 1931. (369,708.)

3,185. "Controllers for reversing the inner drum of electrically operated washing machines." W. W. Triggs (Bohus Mekaniska Verkstads Aktiebolag). January 31st, 1931. (369,709.)

3,410. "Devices for the automatic reception of wireless telegraphic signals." E. N. Elford. February 3rd, 1931. (369,713.)

3,665. "Electric immersion heater." General Electric Co., Ltd., and J. L. Rycroft. February 5th, 1931. (369,714.)

6,325. "Control of electric motors." British Thomson-Houston Co., Ltd. February 28th, 1930. (369,730.)

7,373. "Inductance coil formers." E. W. Evans. March 10th, 1931. (369,735.)

8,179. "Electric circuit breakers or like circuit rupturing apparatus." J. W. Record, and Record Electrical Co., Ltd. March 17th, 1931. (369,740.)

8,791. "Loud-speaker installations provided with a filter." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 24th, 1930. (369,745.)

10,952. "Electric control devices more especially for use with the electric systems of motor vehicles." R. Bosch Akt.-Ges. May 22nd, 1930. (369,767.)

11,917. "Electrical cable installations." General Cable Corporation. May 8th, 1930. (369,772.)

13,289. "Electric fires." H. H. Berry. May 5th, 1931. (369,780.)

14,652. "Means for maintaining a satisfactory oil filling of electric cables." Siemens-Schuckertwerke Akt.-Ges. May 31st, 1930. (369,790.)

18,286. "Loud speakers." Jensen Radio Manufacturing Co. June 27th, 1930. (369,818.)

18,880. "Luminous electric discharge tubes." General Electric Co., Ltd. September 3rd, 1930. (Patent of addition not granted.) (369,824.)

19,764. "Bipolar rotating field magnets for turbo-generators." Dr. O. T. Blathy. July 17th, 1930. (369,830.)

19,798. "Television." Marconi's Wireless Telegraph Co., Ltd. July 17th, 1930. (369,832.)

20,076. "Arrangements for the regulation of the sound strength on musical instruments, from which music is produced by frequency alterations of an electric current." Dr. P. Lertes and B. Helberger. July 16th, 1930. (369,837.)

20,079. "Musical instruments in which music is produced by frequency alterations of electric oscillations." Dr. P. Lertes and B. Helberger. July 16th, 1930. (369,838.)

21,882. "Devices for testing the operation of the sparking-plugs of internal combustion engines." D. Finburgh. July 31st, 1931. (369,849.)

22,333. "Separators for use in electrical accumulators." E. T. Williams, H. Salmon, and Expanded Metal Co., Ltd. December 22nd, 1930. (Divided application on 369,605.) (369,612.)

22,998. "Television and facsimile telegraph systems." Marconi's Wireless Telegraph Co., Ltd. August 14th, 1930. (369,856.)

23,507. "High tension electric cables." Felten & Guilleaume Carlswerk Akt.-Ges. September 26th, 1930. (369,859.)

23,754. "Igniting of immovable electric vapour rectifiers." Elin Akt.-Ges. für Elektrische Industrie. August 26th, 1930. (369,861.)

24,474. "Foundation for electric machines and apparatus carrying high voltage." Siemens-Schuckertwerke Akt.-Ges. September 4th, 1930. (369,863.)

28,226. "Spark-plug testers." A. Kranz. October 10th, 1931. (369,874.)

29,412. "Sparking plugs." R. Bosch Akt.-Ges. November 28th, 1930. (Addition to 344,332.) (369,876.)

1932

228. "Luminous electric discharge tubes." General Electric Co., Ltd. January 13th, 1931. (369,882.)

439. "Remote control systems." Automatic Electric Co., Ltd., G. A. Burns, and P. F. Gunning. December 19th, 1930. (Divided application on 369,570.) (369,579.)

2,379. "Electric motors." General Electric Co., Ltd., and H. C. E. Jacoby. December 22nd, 1930. (Divided application on 38,624/30.) (369,642.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 13th.

Ardoloy. No. 528,584, and Adoloy. No. 529,833. Class 6. Machine tools.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

Electrano. No. 526,689. Class 8. Electrical plug boards fitted with easily detachable terminals, connections, plugs, and sockets for instructional purposes in electricity.—Mellor & Smith, Ingleton, Colchester Road, Ipswich.

Stenode (lettering and design). No. 529,802. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—British Radiostat Corporation, Ltd., 29, George Street, Hanover Square, W.1.

Sangamo. No. 530,027. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—British Sangamo Co., Ltd., Cambridge Arterial Road, Enfield, Middlesex.

Eddo. No. 527,266. Class 13. Electric kettles, irons, coffee percolators, immersion heaters, and electric heating fittings. No. 527,267. Class 18. Electric heating and cooking apparatus. —H. G. Moseley & Co., Ltd., Hospital Street, Birmingham.

Iron Duke. No. 529,026. Class 13. Electric irons.—T. Price and Sons (Stampers), Ltd., Spring Hill Passage, Birmingham.

Herolith. No. 528,173, Elastolith. No. 528174, and Marbolith. No. 528,175. Class 50. Compositions made chiefly from phenol-formaldehyde or casein.—Herold Gesellschaft, Farm Hill, Waltham Abbey, Essex.

Paxbestos. No. 529,733. Class 50. Electric insulating material.—Micanite & Insulators, Ltd., Blackhorse Lane, Walthamstow, E.17.

Alleged Breach of Contract

IN the King's Bench Division on April 15th Mr. Justice Finlay gave judgment in an action by Lloyd-Wood Presswork, Ltd., Birmingham, against Aron Electricity Meter, Ltd., Kilburn, to recover damages for breach of contract.

Plaintiffs' case was that it was agreed that they should manufacture and supply to the defendants 1,000 brass front mouldings and terminal covers, 2,000 sets of plugs and 1,000 extra sets of plugs. They said that they manufactured the goods in accordance with designs and defendants had refused to accept delivery. They claimed the sum of £157 damages, that amount being the difference between the contract price of the goods and the scrap price of the goods, plus part cost of the tools, dies, &c.

Defendants denied that they had rejected the goods, but pleaded that the samples submitted were not satisfactory, and not reasonably fit for the purpose for which they were required. They had refused to accept any goods which were otherwise than in accordance with the contract and sample.

His Lordship, in giving judgment, said that the case turned largely on the correspondence. Mr. Cloutman, for the defendants, had raised several points and alleged that there had been no attempt to tender or deliver. The plaintiffs' reply was that they were always willing to deliver. His Lordship came to the conclusion that the contract was not one to supply goods to sample but in accordance with directions and drawings supplied by the defendant. He thought that the contract was to supply goods as asked for under the contract. In his view the plaintiffs were right here. It was a most unfortunate position, and it was a pity an arrangement had not been arrived at. The plaintiffs were entitled to succeed.

He suggested that the parties should arrive at an adjustment as to the goods, as they were no good to plaintiffs, and might be of some value to the defendants.

The matter was adjourned to enable the parties to endeavour to arrive at some business arrangement.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare (GLAM).—Hospital (£3,000), for U.D.C.; Owen Williams, surveyor.

Aberdeen.—Greyhound track, stand, offices, &c.; Jenkins and Marr, architects.

Acton.—Houses (28), Noel Road, for Great Western Garden Village Society; T. Alwyn Lloyd, architect. Factory, Acton Lane; Wesley Estates, Ltd.

Amesbury (WILTS).—Houses (36); R.D.C. surveyor.

Arbroath.—Houses (60), for T.C.; A. Symon, architect.

Armadale.—Houses (30); K. Macdonald, town clerk.

Axbridge (SOMERSET).—Houses (32), for R.D.C.; Ball & Pope, architects, 30, West Street, Weston-super-Mare.

Bangor.—Factory, for S. V. Beer; G. Morris, architect, High Street, Portmadoc.

Barnsley.—Church hall, Burton Grange Housing Estate; Percy Brooks, Barclays Bank.

Bentley (YORKS).—Rebuilding the Sun Inn; T. H. Johnson and Sons, architects, Priory Place, Doncaster.

Berkshire.—School, Speenhamland (£6,000); G. R. King, builders, Moore Street, Northampton.

Bideford (DEVON).—Hospital (£12,000), for the Joint Hospital Committee; clerk.

Birkenhead.—Flats, Camden Street area; H. J. Rowes, architect, Liverpool.

Blackpool.—Theatre, Britannia Place, South Promenade, for Broadhead Circuit of Theatres; P. P. Broadhead. Hospital, Whinney-Heys (£150,000); board of management.

Bradford.—Reinstatement after fire, textile warehouse property, Bentley Street and Booth Street (£50,000); Estates Dept., Town Hall. Operating theatre, St. Luke's Hospital (£3,000); city architect.

Bridlington.—Rebuilding the Royal Hall for T.C.; A. Everingham, engineer, Town Hall.

Bromley (KENT).—Houses (20), Southborough, for C. H. Morrell.

Burntisland (FIFESHIRE).—Houses (36), Rossend Estate; borough surveyor.

Cannock (STAFFS).—Houses (50); U.D.C. surveyor.

Carlisle.—Housing scheme, Kell Estate; P. Dalton, city engineer, 18, Fisher Street. Electric wiring of 230 houses; P. Dalton, city engineer, 18, Fisher Street, Carlisle.

Catterick Camp (YORKS).—Post office; H.M. Office of Works, King Charles Street, S.W.

Cheshire.—Senior schools, Lymm; director of education, Chester.

Chesterfield.—Houses (23), Staveley, for R.D.C.; Houfton and Kington, architects, Market Place.

Coalville (LEICESTERSHIRE).—R.C. church; Rev. Father Degen.

Coventry.—St. Mary Magdalene Church; vicar.

Dalkeith.—Houses (140); burgh surveyor.

Darlington.—Alterations and additions to Royal Oak Hotel; Kitching & Co., 21, Albert Road, Middlesbrough. Alterations and additions to Coronation Hotel; Wetherell & Dent, architects, Market Place, Richmond (Yorks). Housing scheme, Hundens Estate; E. Minors, surveyor, Town Hall.

Deal.—Houses (120), Mill Hill, for Pearson & Dorman Long, Ltd., Betteshanger Colliery.

Denaby Main.—Extensions to Fullerton Hospital (£5,000); S. Johnson, secretary.

Ealing.—Factory, Wadsworth Road, for L. D. Fraser & Son; Percy Bilton (Inc.), Ltd., 113, Park Street, W.1. Additions to works, Church Road, for the Candy Filter Co., Ltd.; J. Hodges, architect, 101, Great Russell Street, W.C.1.

East Wickham (KENT).—Church (£10,000); Rev. Walter Smith, vicar.

Ellesmere (SALOP).—Houses (28), for the R.D.C.; Mr. Matthews, architect, Nantwich.

Gillingham (KENT).—Methodist Church, Third Avenue; Dinsley & Moss, architects. Factory, for the Chemical Trust of Great Britain, Ltd.

Glasgow.—Houses (54), Trossachs Street; architect, Corporation Housing Department. Houses, Moorepark (516), and Temple (600); housing director. Cinema, Partick (2,000 seats); G. Singleton, proprietor. Catholic school, Dixon Road, Crosshill; education director.

Great Yarmouth.—Church, Newtown; vicar. Houses (126), Middleton Road; borough surveyor.

Grimsby.—Factory, Great Coates, for Watmough and Son; Hewin & Goodhand, Ltd., builders, Eleanor Street.

Hampshire.—School, Hedge End (£11,600); county architect.

Harrogate.—Pump room, sun parlours, tea house, &c. (£60,000); borough engineer.

Hebburn-on-Tyne.—Houses (104); T. Paterson, engineer, Council Offices.

Hertfordshire.—Senior school, Manland Common, Harpenden. Schools, Waterdell, Watford and Bushey; director of education, Hertford.

Hillington (RENFREWSHIRE).—Houses (250); James Y. Keanie, Ltd., contractors, Johnstone.

Hull.—Extensions to Tilworth Grange Mental Hospital (£12,300); city architect.

Hyde.—Houses (200); borough engineer.

Irlam (LANCS).—Telephone exchange; H.M. Office of Works, King Charles Street, S.W.

Isle of Man.—Re-erection of Dhoon Glen Hotel for Reginald Copley Cain.

Jedburgh.—Housing scheme for T.C.; Wilson & Tait, architects, Grangemouth.

Kirkcudbrightshire.—School, Castle Douglas, for the County E.C.; W. A. Mackinnell, architect, Kirkcudbright.

Lamorbey (KENT).—Church for Holy Trinity parish (£4,600); A. S. R. Ley, architect, 214, Bishopsgate, E.C.

Lichfield.—Victoria Cottage Hospital (£20,000); J. R. Deacon, builder, Lichfield.

Liverpool.—Houses (44), Queen Anne Street scheme; director of housing, Municipal Buildings, Dale Street. Headquarters for the Blackburn Philanthropic Assurance Co., Ltd.; W. P. Horsburgh, architect, Exchange Buildings, Liverpool.

London.—(LEWISHAM).—Employment exchange, Holbeach Road, for H.M. Office of Works, King Charles Street, S.W.1. Estate development, off Verdant Lane; Forster Estate Development Co.

Lowestoft.—Development, Wood's Loke Estate; A. Ingles, builder. Houses (20), Waveney Drive; J. Gaze & Sons.

Lydney (GLOS).—Houses (30) for the R.D.C.; Copp Bros., builders, Barry.

Malton.—Houses (32); W. Martin Jackson, architect to R.D.C., Snydale Road, Normanton.

Manchester.—Alterations to hospital block, Nelson Street, Chorlton-on-Medlock; George MacFarlane & Son, Ltd., builders, New York Street, Chorlton-on-Medlock. Municipal school, Wythenshawe, for the E.C.; G. & W. Smith (Builders), Ltd., Hyde Grove.

Montrose.—Cinema, John Street; Alastair MacDonald, architect, London.

Newmarket.—Public house, Cheveley Road; architect to Greene, King & Sons, Ltd., brewers, Bury St. Edmund's.

Norwich.—Elementary school, Catton Grove Estate, for the E.C.

Portland (DORSET).—Cinema; Andrews & Andrews, architects, Weymouth.

Portsmouth.—Church hall and schools, Copnor, for the Wesleyan trustees (£10,000); Rev. R. S. Brealy.

Purley.—Cinema, Brighton Road; H. S. Scott, architect.

Renfrewshire.—Houses (57), Thornliebank; G. W. Dixon & Sons, builders, Whitecraigs.

St. Albans.—Houses (34), Colney Heath; R.D.C. surveyor.

Salford.—Houses (180) for the T.C.; A. Tomkins, builder.

Sanderstead.—Houses (24), Purley Downs Estate; Thomas & Son. Houses (42), Croham Heights Estate; R. Costain & Sons, Ltd.

Sittingbourne and Milton Regis.—Houses (100); U.D.C. surveyor.

Southport.—Bus station, Esplanade (£2,285); borough engineer.

Sowerby Bridge (YORKS).—Houses (26), Park Road, for Miss I. M. Helliwell.

Spalding (LINCS).—Waterworks pumphouse for the U.D.C.; A. E. Palmer, architect, 1a, Pinchbeck Street.

Stansted (ESSEX).—Houses (40); R.D.C. surveyor.

Surrey.—Two schools, St. Helier Estate, Morden, and elementary school (384 places), Ewell; County E.C., Kingston.

Swindon.—Houses (104), estate off Shriveham Road; A. K. Colborne.

Tayport (FIFE).—Houses (32); W. Webster, borough surveyor, Borough Chambers.

Tenbury.—Factory for Worcestershire Canning Co.

Tiverton (DEVON).—Houses (50); borough surveyor.

Tynemouth.—Houses (74 blocks), for T.C.; J. L. Beckett, engineer, Town Hall.

Watford.—Houses (150); borough surveyor.

Weston-super-Mare.—Extensions, Rozel bandstand and shelter (£5,400); U.D.C. surveyor.

Whitehaven.—Houses (100); borough surveyor.

Wigan.—Houses (54); borough surveyor.

Electricity in Mines

THE report for 1930 of Mr. J. A. B. Horsley, H.M. Electrical Inspector of Mines, can be obtained from the Stationery Office at 6d. net. The number of mines working at June 30th, 1930, was 2,328 (91 fewer than in 1929). Those using electricity numbered 1,439 (17 fewer than in 1931). The h.p. of motors installed increased by 62,760 to 1,816,464 (of which 861,680 was in use above ground), and served the following purposes (h.p. thousands): Winding, haulage, and conveying, 649; pumping, 399; ventilation, 120; coal-cutting and portable machines, 113; coal cleaning, 162; miscellaneous, 373. The h.p. of a.c. motors amounted to 80.4 per cent. of the total; the increment was 3.4 per cent., but that of d.c. motors was 3.4 per cent. The number of electrical coal-cutters increased by 253, and compressed-air cutters by 23.

There were eleven accidents involving the loss of twelve lives (one an electrician) and injuries to seven other persons. Eight fatal accidents occurred below ground; these included two explosions of fire damp due to open sparking in electrical apparatus, and six due to shock. The number of deaths due to shock is the same as the average for the past two years, although the h.p. of motors has increased since 1920 by 55 per cent. The equipment involved in fatal accidents was: Switchgear and fuses, 3; flexible cables and plugs, 4; overhead lines, 1; cables in conduit, 1.

Notifiable non-fatal accidents (42) were attributed to: Defects in design or misapplication, 4; faults of maintenance, 8; misuse or negligence, 20; unforeseeable, 10. These were incurred in connection with the following equipment: Switchgear, 19; trailing cables and plugs, 17; armoured cables, 2; overhead lines and unarmoured cables, 2; dynamos and motors, 2.

No electrical accidents were reported at the 93 metalliferous mines using electricity (out of a total of 310), where the h.p. of motors installed was increased by 3,219 to 34,707 (22,938 above ground). In quarries one non-fatal accident was reported. There was considerable activity during the year in the application of electricity to large excavators, or "navvies," supplied by a flexible cable, sometimes at high voltage.